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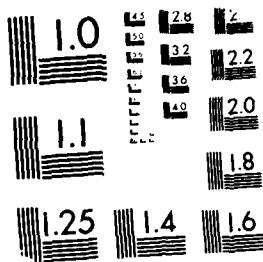
REPORT OF THE HYDROGRAPHIC SERVICE ROYAL AUSTRALIAN  
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HYDROGRAPHIC SERVICE CANBERRA 1987 DODA-AR-999-999  
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DEPARTMENT OF DEFENCE (NAVY OFFICE)



## REPORT

of the

### HYDROGRAPHIC SERVICE

### ROYAL AUSTRALIAN NAVY

for the year ended 30th June 1987

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## INTRODUCTION

By Government direction, the Hydrographic Service of the Royal Australian Navy is "... the Charting Authority in connection with the Hydrographic surveys in Australian waters and Australian spheres of influence in the Pacific". In modern terms and by international arrangements, this area of charting responsibility covers some 11 million square nautical miles of oceans and seas. It stretches from the equator (excluding Indonesia) to Antarctica and from the mid Indian Ocean to the mid Coral and Tasman Seas and includes Papua New Guinea waters under a Memorandum of Understanding.

In broad terms the Service is organised to support defence and civil hydrography and naval oceanography and meteorology. The prime objective is to provide modern accurate charting to meet the safety of navigation and expeditious operational requirements of surface and subsurface units of the Navy and of all shipping servicing coastal and overseas trade.

The planned modernisation of the RAN fleet over the next few years will place increased demands in meeting the objective. The capital costs of new units will total billions of dollars and every effort must be made to ensure enhanced safety of navigation and freedom of manoeuvre particularly in areas 'off the beaten track' and over the Continental Shelf approaches to the mainland and island territories.

On the commercial shipping front, the recent Webber Commission of Inquiry studied the value and value-added components of national maritime trade. An overall value of some \$60 billion per annum was estimated for these activities. The safety of navigation and cargoes carried by ships using the Australian chart series is thus a vital part of the national well being. Because over 90% of the nation's maritime trade is carried in vessels of foreign registry, it is essential that the Australian chart series is both homogeneous and in conformity with the modern standards and practices of the International Hydrographic Organisation of which Australia is an active member.

The task facing the Service is very large and even with the considerable enhancements planned it will still be well into the next century before the revision stage of a complete chart series is attained. For many years my predecessors said "about 50 more years" were required to complete the task, given the resources. Each statement was made in good faith in the light of qualifications and circumstances at the time. However, the 'goal posts' have kept changing. In the 1950's and early 1960's, the advent of electronic position fixing and reliable echo sounders enabling round the clock work seemed to herald the new age. This notion was dashed by the dramatic change in the size and draught of shipping. The danger line at 12 metres (inside which very close examination was required) suddenly became 30 metres and then 60 metres and more for many purposes, rendering many surveys inadequate and greatly increasing the time to do new work. Submarines now operate to hundreds rather than tens of metres of water. Ship owners need to exploit the full cargo carrying capacity of their vessels in shallow and confined waters making further extremely time consuming and stringent demands on precision, and so on. In addition, since the early 1960s, many new ports have been established and old ones enlarged (eg. Dampier, Port Walcott, Port Hedland, Gove, Groote Eylandt, Weipa, Lucinda, Hay Point, Abbot Point, Gladstone, Port Kembla, Port Bonython etc). While the Hydrographic Service is not responsible for port survey and development, the safe approaches and transit routes are very much a part of the bailiwick.

New challenges are already above the horizon. GPS will transform the present relative practice of navigation to an absolute activity with its own problems particularly evident in the older charts. The electronic chart, already at advanced experimental stage, will challenge to the limit the assessment and organisation of data management. Except in the very large scale charts, present concepts and usage of scale will have to disappear as the user's ability to zoom, pan, enlarge and reduce data becomes accepted practice.

Nevertheless, real progress is being made and a number of new initiatives are in train to improve capability and to enable the Service to accommodate these changes. On the data acquisition side, Survey Motor Launches, the Laser Airborne Depth Sounder and the Hydrographic Data Logging and Processing System are prime examples. On the production side, the Service like many other organisations has moved from the expectation to the reality of the computer age and the explosion of information management technology with the installation of a sophisticated Geographic Information Management System called the Hydrographic Information System. Great benefits will be realised in the medium to long term by adopting these hardware concepts and methodologies, but the transition from traditional manual and analogue techniques is very demanding on scarce manpower resources. It is of interest to note that 10 years ago the Service received annually about 250 documents affecting about 90 charts. Today some 1000 documents affecting over 500 charts are received and the trend is still strongly upwards, which is beginning to cause considerable strains on assessment and production capability.

Having set the scene, this report briefly describes the activities of the Hydrographic Service and the measures being taken to realise its prime and supporting objectives. I hope you will find it both interesting and informative.

  
S. COMPTON  
Captain RAN  
HYDROGRAPHER

## **SURVEY OPERATIONS, PLANS AND DEVELOPMENT**

### **General**

The Marine Science Force has remained at a strength of five units throughout the year, with four hydrographic vessels and the oceanographic ship HMAS COOK. A detached survey unit, based at the Hydrographic Office, has been active, with surveys in Vanuatu and the Antarctic. In addition, personnel from the Hydrographic Office have embarked in craft of opportunity on several occasions for specific tasks of an urgent nature.

HMAS MORESBY has continued her programme of surveys of the deeper waters off the northwest coast of Western Australia, whilst her boats have been employed mainly in the Bonaparte Archipelago. HMAS FLINDERS resumed surveys in Papua New Guinea waters, the first RAN involvement in this area of Australian charting responsibility for more than ten years. In addition, she has carried out surveys in Bass Strait and on the Arnhem Land Coast. The Interim Survey Ships (ISS) HMAS BRUNEI and HMAS BETANO have undertaken surveys in the Great Barrier Reef Inner Route. They have also carried out large scale reconnaissance operations in northern waters and have been deployed to Western Australia in support of MORESBY'S boats.

Overall, it has been a productive year. MORESBY and FLINDERS lost little time from mechanical breakdowns or survey equipment failures, but both suffered from the weather when it was necessary to break with tradition and deploy them to northern waters during the summer (Jan-Apr) season. FLINDERS' progress in particular was painfully slow at times during periods of prolonged tropical downpour off Arnhem Land. BETANO and BRUNEI both suffered above average levels of defects and equipment failures, although their loss of time through bad weather was no worse than anticipated. These vessels are particularly suited to the reconnaissance and support roles and are providing excellent experience in the operation of small craft prior to the introduction of the Survey Motor Launches in 1988-9.

All four vessels played a full part as fleet units in the areas of surveillance, search and rescue and public relations, and exercised with other RAN vessels on frequent occasions. The two ISS both took time out from survey operations during the year to exercise their amphibious role.

Details of individual ships' activities may be found in the ensuing ship reports, and in the Appendices.

### **Ship and Unit Reports**

#### **HMAS MORESBY**

MORESBY completed three major offshore surveys and two large scale inshore surveys during the period covered by this report. All surveys were conducted off the North West region of Western Australia. Three Assisted Maintenance Periods (AMP) were conducted at HMAS STIRLING, Garden Island Western Australia, between surveys.

The months of July and August 1986 were spent in AMP. The first inshore survey commenced on 18 September 1986 and was a combined ship/boats survey at a scale of 1:25,000. It was undertaken to prove the least depth along a proposed new route for unladen vessels bound for the major iron ore port of Port Hedland. It was successfully completed by 30 September when MORESBY moved offshore to undertake a survey of the South West Approaches to the Sahul Banks. The new route, with a least depth of 10.5 metres, has since been buoyed by the Port Hedland Port Authority and is open for traffic, allowing laden outbound vessels full use of the main channel without hindrance from inbound vessels.

The Sahul Banks are significant for the Jabor and Challis oilfields, the Jabor field being at production stage. Challis at the exploratory stage. The approaches to the Sahul Banks are poorly charted at present, limiting access to the fields. This survey will significantly improve access to one of Australia's most valuable oil assets. MORESBY returned to HMAS STIRLING in mid November, on completion of the survey period, for an AMP and leave.

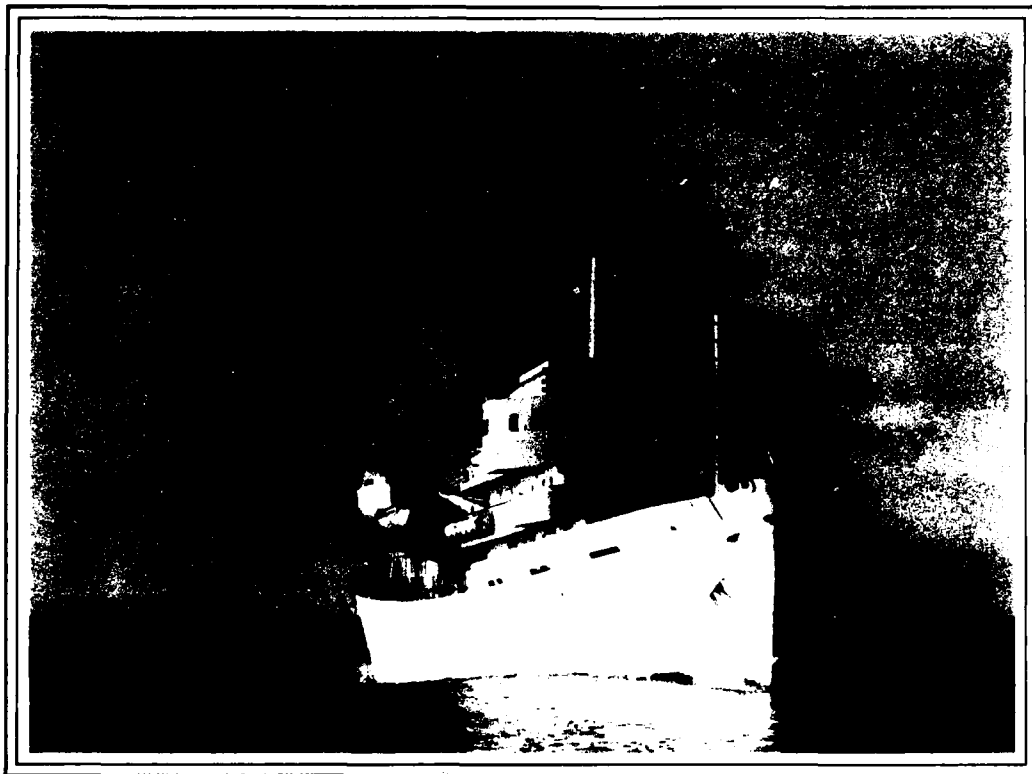
Late in January 1987, the ship sailed for a survey of the Holothuria Banks, off the northern most part of Western Australia. The Survey Motor Boats (SMBs) were operated daily from the ship, in order to maximise their time on task in the offshore shoal areas. The passage of three tropical cyclones close to the survey area, during the early period of the survey, slowed the ship's progress and hampered boatwork. Later, however, the onset of the 'dry season' brought good sounding weather, enabling a great deal of the assigned area to be completed.

The Banks proved a very complex area, necessitating extensive shoal delineation and investigation by both ship and boats. A deep water passage, the Penguin Deep, was proved through the Holothuria Banks, considerably shortening passage between the Western Timor Sea and the lower parts of Joseph Bonaparte Gulf. The survey ended on 27 March with the ship's return to HMAS STIRLING for 5 weeks for the Annual Inspection and an AMP.

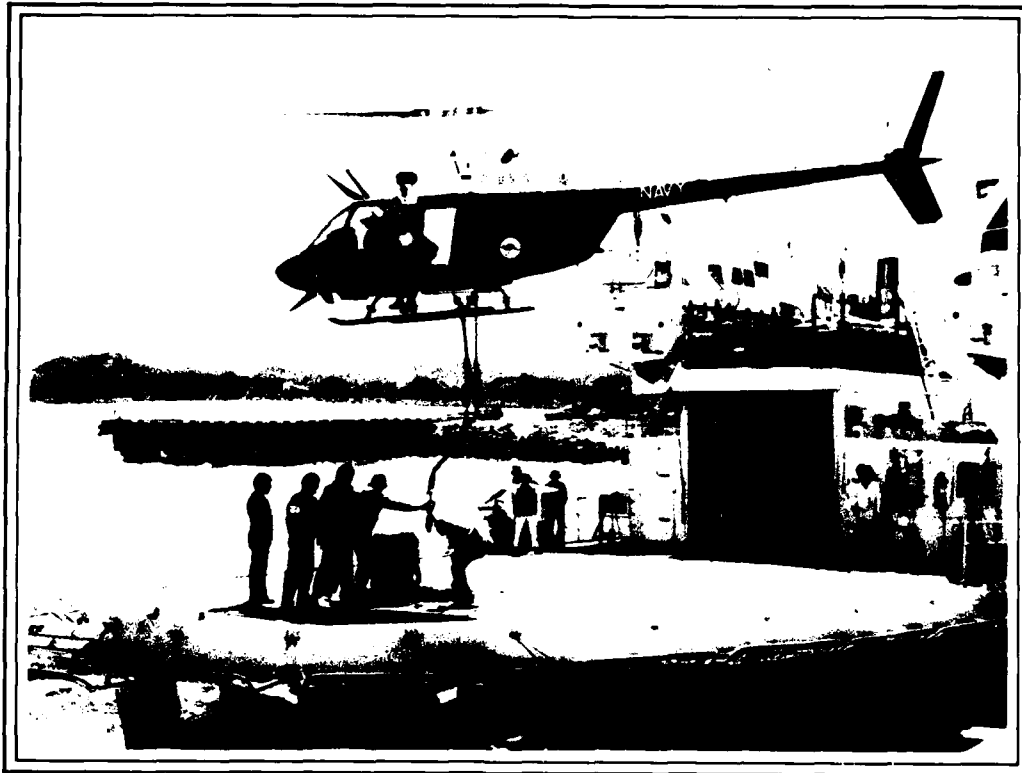
During May and June, MORESBY conducted two surveys off the North West coast of Western Australia. The first was a 1:10,000 survey of the West Lagoon of Ashmore Reef, with its Approaches at 1:25,000, in order to prove a safe, sheltered anchorage for Australian vessels engaged in monitoring and inspecting the fishing fleets operating in the surrounding waters. The lagoon was tackled by the SMBs whilst the ship sounded the deeper areas clear of the reef.

On completion of the Ashmore Reef survey, the SMBs were detached to Montague Sound where, under the direction of HMAS BRUNEI, a survey of these waters was undertaken. MORESBY established the infrastructure for this survey and then proceeded further offshore to continue the South West Approaches to Sahul Banks, commenced in October 1986. The SMBs were recovered from BRUNEI's care in mid June, having completed a very large tract of this hitherto unsurveyed area. MORESBY returned to HMAS STIRLING on 26 June in preparation for a six month refit.

It was a good year for the ship in terms of both surveying output and serviceability of machinery and equipment, with few defects to hinder survey progress. The helicopter, however, suffered above average downtime through mechanical failures, resulting in a loss of productivity whilst detached parties were serviced by ship and boat.



HMAS MORESBY CONDUCTING SQUAT TRIALS  
IN EXMOUTH GULF, JUNE 1987



*HMAS MORESBY - FLIGHT DECK TRAINING*



### **HMAS FLINDERS**

FLINDERS completed the route survey through the Star Reefs in Papua New Guinea during July 1986. A deep, safe passage, the existence of which was indicated by LANDSAT imagery, was proven. The passage is limited by the absence of topography and navigational aids; the feasibility of establishing navigational aids rests with the PNG Government. The passage provides a shorter route for coastal shipping from Port Moresby to Lae and for international shipping from Australia to east Asian ports.

During the early part of July, the ship's survey motor boat (SMB) completed a large scale survey of the approaches to Kalamadau, an important timber exporting port on Woodlark Island. After visiting Rabaul and Port Moresby, FLINDERS returned to Cairns on 25 July for a month's leave and assisted maintenance period.

From August to November, FLINDERS worked in southern waters on a variety of survey tasks. The ship visited Sydney for the first time since deploying to Cairns in 1974. The major task was a re-survey of the Cape Otway Focal Point with particular emphasis on examination of shoal pinnacles in the area, which is a major shipping route and fishing ground. The 10 metre shoal on which MV BRAVENES grounded in 1983 was confirmed but no other significant shoals were found.

Other survey tasks during the southern deployment included large scale surveys of Port Giles, South Australia and Murray Pass in the Kent Croup, Bass Strait. A number of shoal examinations in or near the shipping routes through Bass Strait were also undertaken one of which resulted in a depth of 7.2 metres on a previously reported 29m (PA) patch in 60 metres of water. The period spent in Bass Strait was marked by an above average incidence of bad weather, which hampered progress and prevented deployment of the SMB on several occasions.

As well as the survey tasks, FLINDERS played its part in a number of events to celebrate the Seventy Fifth Anniversary of the RAN. FLINDERS led the small ships' review line in the Fleet Review on 4 October in Sydney; five of the seven former Commanding Officers of FLINDERS were gathered onboard for this prestigious event. On 19 October, FLINDERS played a key role in the re-enactment of the 1802 meeting between Matthew Flinders and Nicholas Baudin in Encounter Bay, with HMS AMAZON and FNS COMMANDANT BLAISON taking the parts of HMS INVESTIGATOR and LE GÉOGRAPHE. FLINDERS joined twelve other RAN and allied naval ships for a major visit to Adelaide from 22 to 28 October to celebrate both the Navy's Seventy Fifth Anniversary and the South Australian Sesquicentenary.

After a well deserved maintenance and leave period over Christmas, FLINDERS sailed on 12 January for Arnhem Land, to survey the area between the Wessel Islands and Gove Peninsula. Passages through the Wessel Islands and the English Company's Islands were surveyed and found suitable for use by medium sized vessels. These passages will considerably shorten the distance from Darwin to Gove. Existing charting was updated in the approaches to these passages. Poor weather severely hampered survey operations with persistent tropical downpours and three tropical cyclones, (Irma, Jason and Kay) disrupting the ship's programme and causing failure of survey equipment both ashore and on board.

Another difficulty found by FLINDERS during this survey was the absence of detailed tidal information in a most complex tidal area, and considerable time was spent collecting data to construct an accurate tidal model.

The Wessel Island survey concluded in April when FLINDERS returned to Cairns. The ship commenced refit late in the month and is expected to remain in dockyard hands until the end of July 1987. FLINDERS should resume surveying operations in August in the Torres Strait area.

### **HMAS BRUNEI**

At the beginning of July 1986, HMAS BRUNEI carried out a large scale survey of the Red Island Point (Bamaga) area. This was only a short survey to verify the existence of two potentially dangerous rocks, and on completion the ship returned to Cairns for one week of maintenance. During the remainder of July and early August BRUNEI was involved in an amphibious exercise with HMA Ships TOBRUK and LABUAN.

August and September saw the ship undertake Intermediate Docking at Cairns as part of her routine operational cycle before departing to her next survey task on 14 October. This was another short survey to sidescan sonar sweep a bypass to a section of the Two Way Route between Nymph Island and the Turtle Group, and was followed by further sonar work in the Deep Draught Route through the Howick Group. This was completed at the end of October and BRUNEI returned to Cairns to prepare for involvement in Exercise KANGAROO 86, rounding off amphibious commitments for the year. At the end of November BRUNEI returned to Cairns for an Assisted Maintenance Period and Christmas Leave.

From 12 January to 19 March 1987 BRUNEI was employed on surveys of the Inner Barrier Reef route between Lizard Island and Gubbins Reef. This involved completing outstanding segments north of Cape Flattery from the previous season, then progressing south to Cooktown with side scan sweeping of the Two Way route, and the sounding of coastal and seaward sides of the Route. The assistance of HMAS BETANO for approximately one month during the survey highlighted some of the aspects of a two ship task, giving an indication of forthcoming SML operations. Fortuitous weather for the first part of the season enabled satisfactory progress on the survey and made up for the unfavourable weather during the latter period.

One month's maintenance in Cairns saw BRUNEI preparing for a lengthy deployment on 21 April to Montague Sound. This survey was to oversee HMAS MORESBY's three SMBs in a survey from Cape Voltaire to west of Bigge Island.

Despite some adverse weather and equipment problems, excellent progress was made and the four units completed all the priority A area and three quarters of priority B.

BRUNEI returned to Cairns on 26 June for refit. Despite an above average loss of survey time due to equipment failures, especially echosounder and navaids, the year has been a most productive one.

### **HMAS BETANO**

At the beginning of July 1986 HMAS BETANO sailed from Darwin for Operation Beachcomber 86 with Clearance Diving Team One and Army personnel embarked. The operation involved beach surveys, exercise minefield clearances and vigia investigations between Broome and Cape Londonderry on the north Western Australian coast.

After a period at Darwin Naval Base in early August, BETANO sailed to conduct survey reconnaissance in the Wessel Islands area. As the survey area fell within the Arnhem Land Aboriginal Reserve a representative of the Aboriginal Sacred Sites Authority was embarked for the duration of the task. During the two week survey a horizontal control chain was established through the islands to facilitate HMAS FLINDERS' planned Coburg/Wessel survey in early 1987. BETANO returned to Cairns for an assisted maintenance period at the end of the month.

In mid September BETANO deployed to the Inner Barrier Reef survey area and sounded a corridor to the west of the Howick Island group. Unseasonable light north easterly winds throughout the survey were a pleasant change from the strong south easterly trades which normally prevail. The work served to complete the sounding of the deep draught vessel route between Lizard and Barrow Islands. Before return to Cairns two entrances to the outer reef, Cook's Passage and One and a Half Mile Opening, were delineated using the ship and a light utility boat. The ship returned to Cairns and entered refit at the beginning of October.

On completion of refit, workup exercises and a successful Operational Readiness Evaluation BETANO joined HMAS BRUNEL in the North Cairns Survey Area in January 1987. BETANO's primary task was to carry out a side scan sonar sweep of the section of the Inner Great Barrier Reef Two Way Shipping Route between Cape Flattery and Three Isles. Operations were hampered to some extent by equipment defects, however the mutual support offered by both Interim Survey Ships working in company enabled the sonar sweep to be completed by early February. By the end of the month both ships had successfully completed all specified tasks north of South Cape Bedford.

After an assisted maintenance period in Cairns, BETANO landed all survey equipment and sailed southward on 24 March to join with HMA Ships TOBRUK and LABUAN in amphibious operations. Exercise Initial Landing 87 was conducted in Moreton Bay and the Brisbane River and involved several Army and Air Force units.

BETANO returned to Cairns for the Easter weekend and re-embarked survey modules and equipment before sailing for an extended survey reconnaissance of the Arnhem Land coast. The busy period in the north included deployment of bottom mounted tide gauges, extensive tidal observations, re-establishment of a horizontal control network and selection of suitable sites for future boat camps and tidal stations. As the entire area falls within the Arnhem Land Aboriginal Reserve, primary importance was placed on liaison with the local communities and obtaining permission to occupy selected sites. The reconnaissance conducted between April and the end of June established the framework for hydrographic survey operations in the region for years to come.

### **Hydrographic Office Detached Survey Unit**

The period under report opened with the Hydrographic Office Detached Survey Unit embarked in the chartered Department of Transport vessel MV CAPE PILLAR, undertaking the Bathymetric Survey of the EEZ of Vanuatu. This survey was a continuation of the work done in 1984 and carried the survey up the east side of Vanuatu and around the north of the Banks and Torres Islands.

On return from Vanuatu on 20 November, preparations began immediately to enable the Unit to deploy to the Antarctic as part of the Australian National Antarctic Research Expedition in January 1987. Much additional equipment had to be procured while a standard 34 foot survey boat had to be converted for cold weather operations. The Unit departed from Hobart on 9 January 1987 in MV ICEBIRD, a German registered ice strengthened ship chartered by the Antarctic Division, bound ultimately for Mawson Base in Mac Robertson Land, where the Unit was based for six weeks.

This expedition was the first involvement of the RAN Hydrographic Service in the Antarctic for 25 years and was the first year's work of a 5 year rolling programme. As the RAN had not been involved in cold weather operations for many years, the members of the Unit faced a very steep learning curve.

The survey at Mawson was in two parts; the primary objective was to provide a safe deep water route out to 15 miles offshore through the offlying rocks to enable supply ships to proceed safely to Mawson Base. The secondary objective was to survey and prove an alternative route into the Base itself should the existing route be blocked by grounded icebergs. Although the Unit's survey boat broke down before the completion of the outer survey, more than 75% of the area was completed.

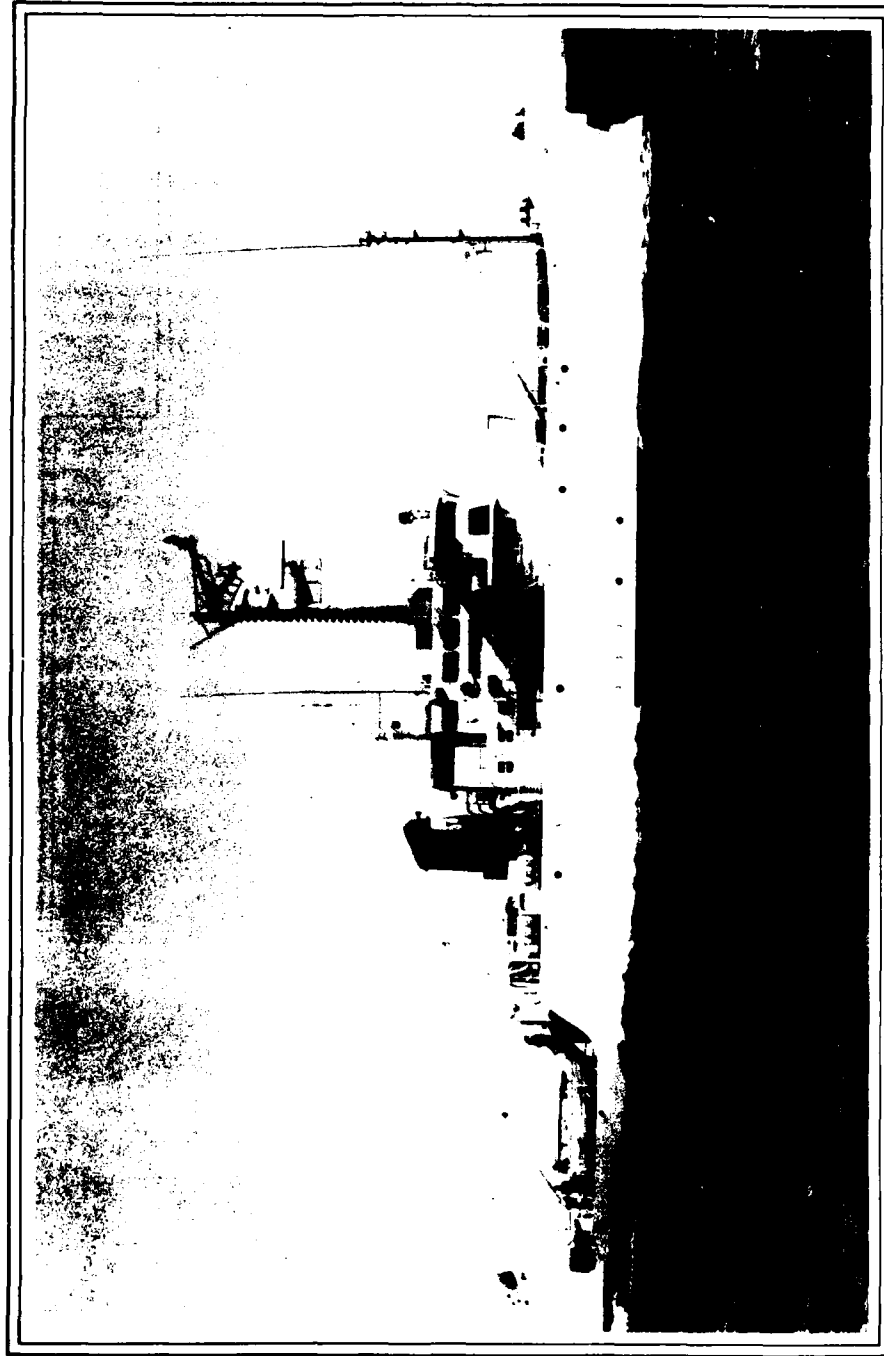
On return to Sydney at the end of March, planning began for a joint ADAB/DCP survey of the Solomon Islands EEZ commencing on 21 June 1987. Once again, MV CAPE PILLAR is being used for the task with a greatly enhanced equipment fit.

### **HMAS CAIRNS Hydrographic Support Unit**

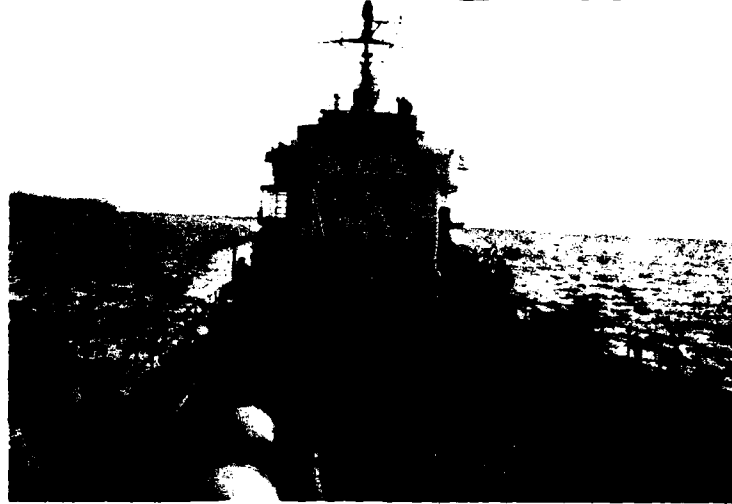
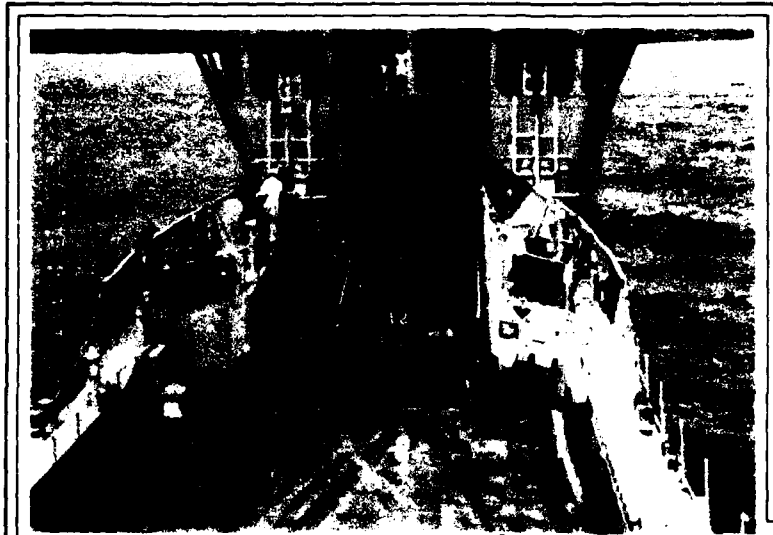
The Support unit at HMAS CAIRNS has become progressively more active during the past year. Activities have included assistance to HMA Ships FLINDERS, BRUNEL and BETANO with the preparation, compilation and rendering of survey data and the monitoring of survey equipment and maintenance. In addition, the unit has been able to act as a focal point for stores support and a pool of hydrographic expertise to cover temporary shortages of personnel at sea. One of the most important support functions has been the acquisition of registered Aboriginal lands passes for units operating off the Arnhem Land coast.

The Unit has also undertaken several tasks in its own right, including:

- a) provision of hydrographic expertise to assist the removal of historic guns from Goods Island in the Prince of Wales Channel, for restoration;
- b) geodetic and positioning assistance to the Minehunter Inshore project;
- c) assistance to the Cairns Port Authority in the form of tidal data acquisition and processing, and a side scan sonar survey;
- d) establishment and maintenance of EPF system stations for hydrographic surveys in the local area.



HMAS FLINDERS ENTERING SYDNEY HARBOUR 29 AUGUST 1986 ON  
HER FIRST VISIT SINCE DEPLOYMENT TO CAIRNS IN FEBRUARY 1974



HMAS BETANO IN THE AMPHIBIOUS ROLE

#### **RAN Adviser to the Solomon Islands Hydrographic Unit**

At the request of the Solomon Islands Government the Australian Defence Co-operation Program has assisted in the setting up of a Hydrographic Unit in the Solomons.

The assistance has been in the form of equipment, training of Solomon Islanders at both the R.A.N. Hydrographic School and Office, and the provision of a Chief Petty Officer Survey Recorder as an Adviser.

The unit is equipped with the Mini-Ranger 3 position fixing system and Raytheon DE 719B echo sounder and has a 5.3 metre Light Utility boat as its sounding platform.

As well as carrying out surveys the unit produces and prints metric charts to International Standards and operates a 'B' Class Chart Agency.

Between July and September 1986 the unit carried out a coastal survey of an area between Lunnga Point and Tenaru Bay, east of the capital, Honiara. This survey was part of a feasibility study for the re-location of LPG and petroleum storage facilities for Honiara.

During February and March 1987 the unit conducted a survey in Roviana Lagoon, New Georgia to find a safe passage through the lagoon to the mainland. The passage is required to transport construction materials and equipment to the site of a proposed new Provincial Secondary School.

#### **RAN Adviser to the Vanuatu Hydrographic Unit**

The Vanuatu Hydrographic Unit was established in March 1987 with the appointment of an RAN Chief Petty Officer Survey Recorder as an adviser for a two year period, sponsored by the Australian Defence Co-operation Programme.

The Hydrographic Unit is a section of the Survey Department and, in addition to the RAN adviser, comprises two Hydrographic Surveyors and one Seaman Survey Recorder, all of whom were trained at the RAN Hydrographic School. It is intended to recruit one more Survey Recorder and maintain the Unit strength at four or five personnel.

The main work of the unit in its first few months has been the evaluation of requirements, both equipment and charting. However, in April the Unit conducted a survey of Ardnamn Wharf in Port Vila on a scale of 1:500, using a chartered local boat.

Early objectives will be the formulation of a scheme for coastal surveys in Vanuatu, with the intention of supporting the BA Chart coverage, and the establishment of a database of hydrographic information. There are no plans, at present, to publish any charts locally. The acquisition of a dedicated survey launch, of about 10 metres length and suitable for coastal surveys, is a high priority of the unit.

#### **Hydroscheme**

Hydroscheme is the document which promulgates the RAN surveying and charting programme for a five year period.

The concept of a 5 year forward plan for RAN hydrographic surveying activities was introduced in 1960. Early Hydroschemes were developed by the Hydrographer after direct consultation with maritime commercial interests and maritime authorities.

In 1975 this concept was modified as it was considered that the Marine Operations division of the Department of Transport was best placed to ascertain the commercial viewpoint and to evaluate the economic advantages that might accrue from hydrographic surveying activities. Defence requirements are assessed separately and incorporated into the final document.

Because any programme involving ships and the environment is susceptible to delays, and because, as time goes by, new requirements for surveys and charting can arise which may alter priorities previously allocated, it has been found that Hydroschemes become out-dated well before their planned 5-year time frame has come to an end. To overcome this, Hydroscheme is now being reviewed and re-issued annually, thereby becoming a 5-year rolling programme.

Hydroscheme 88 (the plan for year 1988 - 1992) is in course of preparation and will be published in November 1987.

#### **Surveys Planned July 1987 - July 1988**

**Arnhem Land Coast (East) and Wessel Islands.** HMAS MORESBY, HMAS FLINDERS and 4 Survey Motor Boats. February/March 1988. The intention is for the SMIBs to survey the north-western side of the Wessel Islands, Brown Strait and Stretton Strait. The ships will sound off-shore in the area south of 14° South.

**Simpson Channel (Torres Strait).** HMAS FLINDERS assisted by HMAS BETANO and HMAS BRUNEL. August/December 1987. A medium scale survey will be conducted in the western approaches to Torres Strait to confirm the access for a deeper route through the strait which will bypass Gannet Passage and Prince of Wales Channel. Should the concept prove viable a long range programme will be developed to take large scale surveys from Hocking Patches in the west through Simpson Channel, to the area of East Strait and Twin Islands in the east.

**Claremont Isles.** HMAS BETANO. December 1987. A side scan sonar survey will be made of the route used by deep draught vessels between Fife Island and Eden Reef in the Inner Great Barrier Reef Route.

**Cairns North.** HMAS BETANO, HMAS BRUNEL. January-March 1988. The sounding and sonar sweeping of the Two Way Route between Cooktown and Low Isles will be progressed.

**Wewak to Madang.** HMAS FLINDERS assisted by HMAS BRUNEL. May-July 1988. The coastal strip from Wewak to Madang will be surveyed and hopefully time will permit some work in the vicinity of Karkar Island, Long Island and Vitiaz Strait.

**Bathymetric Surveys, S.W. Pacific.** The Hydrographic Office Detached Survey Unit, embarked in MV CAPE PILLAR, will carry out a deep water survey of the Santa Cruz Islands area from July to October 1987. This programme of surveys is jointly funded by the Australian Development Assistance Bureau and the Defence Co-operation Program.

**Antarctic.** Approaches to Davis. January-February 1988. Following the successful boat survey at Mawson Base in January/March this year, it is planned to carry out a similar operation using a survey boat shipped south on MV ICEBIRD.

## Projects and New Equipment

### Medium Hydrographic Ships

The MHS project was developed because of the need to increase the Hydrographer's data gathering capacity consistent with Government policy as expressed in the Defence White Paper.

The results of a recent study indicate the most efficient vessel for the coastal and open ocean survey task appears to be a ship of approximately 60 metres in length with a survey speed of about 12 knots. The project to acquire three such vessels is at the early stage of committee consideration.

It is proposed to introduce the ships into service during the period 1993 to 1995 which will enable the manpower from MORESBY to be transferred to the MHSs as she reaches end of life in 1993.

### Survey Motor Launches

Tenders for the construction of four SMLs have been evaluated by Navy Office and a preferred tender has been selected. Ministerial approval to enter into negotiations is presently awaited.

### The Laser Airborne Depth Sounder (LADS) Project

The LADS Project Definition Study (PDS) completed in September 1986, resulting in a comprehensive 12,000 page data package. The PDS was conducted to develop the proven concepts and produce documentation which will allow Australian industry to construct a LADS system. This document encapsulates not only the invaluable experience gained by DRCS throughout the WRELADS trials, but uses the innovative ideas put forward by industry and also input provided by the Hydrographer, RAN.

The Production Phase will involve aircraft acquisition, aircraft modification, subsystem production and integration, optimisation trials and evaluation. This Phase, which will last three years, will be managed by the LADS Project Director within the Naval Materiel Division. A unique change to the management process is the establishment of a DSTO Design Authority to liaise with industry during production to help sort out design and other technical problems as they arise. This team, responsible to the Navy Project Director, has been formed from DRCS personnel who have been involved in both the WRELADS trials and the PDS.

#### LADS System Update

Much has been published on the LADS system, however some aspects of the design and operation concept are worthy of further explanation. It is in these areas where LADS is superior to other airborne laser systems.

**Development:** LADS has had 15 years of comprehensive development, involving over 150 hours of successful system trials and a four year PDS utilising the experience within Australian Industry, DRCS and the RAN Hydrographic Service. The LADS design has considered all the relevant aspects of hydrographic charting to ensure the system will not be just a reconnaissance 'tool', but a system, which will be able to conduct accurate hydrographic surveys in shallow hazardous waters.

**Bias Model:** Waves, ripples, multiple scattering in water and a relatively large receiver field of view cause the average path length of signal photons to increase. This effect exaggerates the depth and results in an error. This effect was examined during the WRELADS 2 trials, and 'smart' algorithms have been developed to quantify the error. This is one particular area of the LADS development where hard up-front experience is necessary to develop such an innovative system.

**Ground Equipment:** The LADS system has been designed to operate specifically from remote sites. The ground equipment and spares will be housed in two 10m ISO containers capable of being transported to selected sites by road.

**Data Analysis:** With LADS about 2.5 million soundings will have to be examined after each four hour sortie, thus only a minimum of human intervention and monitoring will be possible. The GASS will allow for immediate post sortie analysis of data, and will display to the operator areas which require reflight or further investigation. All validated data will then be stored in memory for progressive survey analysis.

**Spares:** the system will have available 100% spares support in the field to ensure that mission time will not be wasted in awaiting repairs. The system has been divided into Field Replaceable Units to facilitate rapid fault isolation and repair.

**Navigation:** LADS will be built with NAVSTAR GPS as the navigation system. At this stage 'P' code will be employed, however, later developments may see the inclusion of a 'differential' application.

#### LADS Operation

Many studies and operational concepts have been examined to determine the most efficient way for the Navy to operate such a system. RAN Hydrographic personnel will operate the LADS system and process the data collected. Contract personnel will be responsible for all other facets of the system - hardware and software maintenance, spares support and aircraft operation.

Apart from general survey operations, two areas where LADS may be invaluable are operations in hazardous areas, and where a 'quick look' is required to determine if further operations are feasible.

Without a doubt, laser airborne hydrography can be used to provide a very significant contribution in the survey of Australian coastal waters. The LADS system will provide high density data and complement the present traditional methods.

The LADS system has the ability to fulfill a vital role in satisfying defence and commercial shipping concerns over much of Australia's shallow continental shelf waters.

At present Australian scientists are the world leaders in Laser Bathymetry.

### **The HYDLAPS Project**

Following evaluation of tenders for the Hydrographic Data Logging and Processing System (HYDLAPS) two contracts were let in August 1986 for Project Definition Studies. These were delivered in January 1987 and evaluation is now complete. A contract for the supply of the equipment is expected to be let in September.

MORESBY and FLINDERS will each be fitted with separate systems for data logging and data processing, with each system having almost identical hardware to provide a measure of redundancy. There will be interfaces to all the existing sensors and nav aids, plus GPS and heave compensators. The processing systems will support four independent streams of editing and plotting, to allow boats' work to be handled simultaneously on the ship systems. A major feature will be the ability to merge data from ship and boats into one digital model with any clashes resolved. A similar processing system will be installed in the Hydrographic Office for quality control, training and survey planning, and to provide the interface with the Hydrographic Information System.

The systems to be procured for the survey motor boats and the Hydrographic School will retain most of the functions of the ship system, but will lack their storage capacity and processing power. They will be configured either as data loggers or as processors by a software change, although much of their data will be processed on the ship systems.

The Survey Motor Launches, when they are introduced into service in 1988-9, will be fitted with similar systems enhanced as necessary to give full ship system capability. The result will be complete integration of systems between units and the Hydrographic Office allowing free interchange of digital data.

The fitting programme is expected to commence with HMAS MORESBY in mid 1988, followed by extensive acceptance trials prior to fitting in the other MSF units.

### **Digital Tidegauges and Current Meters**

A project to replace existing unreliable tide gauges and current meters was progressed during the year with an agreed acquisition date of about September 1988. Apart from being more reliable, the new equipment will give the Hydrographer the capability to obtain tidal data in areas where at present it can only be obtained by the use of leased equipment at considerable cost. Outputs will be digital and compatible with the data logging and data based systems both ashore and afloat.

### **Doppler Logs**

This project aims to procure three doppler logs which are to be fitted in MORESBY, FLINDERS and COOK. Tenders for the supply of the logs will be received during August 1987 and evaluation of the documentation is expected to be completed shortly thereafter. A contract for the supply of the logs and associated spares is expected to be issued later this year.

These logs will replace the unreliable pitometer log in MORESBY and EM logs in FLINDERS and COOK. The major attributes of these new logs are that they are dual axis with readouts in both directions, are microprocessor-based, and have an RS 232 serial output for interfacing with the logging sub-system in HYDLAPS.

### **Global Positioning System (GPS)**

The joint project for the acquisition of GPS equipment for the ADF progressed during the year. The Hydrographic Service will acquire a number of receivers for ship, helicopter and shore use. Delivery is anticipated in 1989.

### **Simrad Sonar**

During the year a project was developed for the replacement of existing bridge recording units. It is likely that the new units will be acquired during this financial year with installation to occur as each ship becomes available.

### **Other Equipment**

Sokkisha RED2L EODM equipment is now in service to complement the long range MR 47s. Both will be serviced by the Royal Australian Army Military Engineers. Argo DM54 and Mini Ranger MRSIII continue in service pending the introduction of GPS, when the need for their replacement will be reviewed. Raytheon DE719C echo sounders have been acquired to complete the fit of the ISS, and several types of sounder, tide gauge and current meter have undergone field evaluation at the Hydrographic School.

The Australian Development Assistance Bureau has funded the purchase of new equipment for the Hydrographic Office Detached Survey Unit, including:

- Qubit TRAC/CHART IVB logging and processing system.
- Raytheon DE719C and Oden Digitrac.
- Krupp Atlas Desoscript.

A suite of surveying, computing and drafting equipment is being acquired for the Hydrographic Unit, HMAS CAIRNS, to allow them to increase their support for operations in the North Queensland area.

### **Trials**

HMAS MORESBY carried out trials of the TSS 320 motion compensator during her last northern season. Heave compensation is viewed as an essential aspect of the HYDLAPS Project.

Both MORESBY and HMAS FLINDERS commenced a series of trials, under carefully controlled conditions, to determine the effects of 'ship squat' on echosounder displacement at various speeds and depths of water. Results to date indicate that an empirical relationship can be derived between the three variables for each vessel, which will allow automatic compensation for the effect in HYDLAPS. This will relieve one of the more obvious uncertainties in the accuracy of soundings obtained in critical shallow areas such as Torres Strait.

## OCEANOGRAPHY AND METEOROLOGY

### General

The Hydrographer is responsible for the development of oceanographic and meteorological policies, priorities and practices in the RAN. The Director of Oceanography and Meteorology (DOM) performs these functions on behalf of the Hydrographer.

Liaison is maintained with various civilian oceanographic organizations such as the CSIRO and joint projects are undertaken from time to time. Where possible, hydrographic units collect data for further analysis by these organizations. Much of the Fleet Support emanates from the Naval Weather Centre (NWC), NAS NOWRA. Specialised training in oceanography is carried out in the Surface Warfare Officer Training Course at HMAS WATSON and at the Australian Joint Maritime Warfare Centre. Outside these areas oceanographic work falls to HMAS COOK and the AODC.

### HMAS COOK

HMAS COOK has had a varied and eventful year which has included eight oceanographic cruises, four dockings and the role of review ship for the RAN 75th Anniversary Fleet Review.

### Oceanographic Cruises

All of the ship's operations for the year were carried out in the Tasman Sea. Two SEAMAP Cruises were conducted between Sydney and Cook Strait. The aim of these cruises was to study the effect of the water column and sea floor on acoustic propagation over long ocean paths. During the August - September cruise conducted in the oceanic winter, the ship visited Lyttleton; in February, in the oceanic summer, a visit was made to Nelson.

The remainder of the year's work included:

- Investigations across the Tasman Front, the boundary between Tasman Sea and Coral Sea water;
- An acoustic and geophysical survey over the predicted position of a sea noise and volcanic centre located 400 miles north east of Hobart;
- A bathymetric and geological survey of the Bass Canyon area at the eastern end of Bass Strait. Dredges were carried out to collect geological samples; and
- Trials on the Acoustic Deep Ocean Bottom Experiment (ADOBE) equipment and a pressure test at 1000m as part of the CSIRO's BUNYIP experiment.

### Other Events

Oil leaks from the controllable Pitch Propellers and repairs to the Active Rudder necessitated dockings in August, January and March. From November to mid December the ship underwent an Intermediate Docking at the State Dockyard, Newcastle.

The highlight of the year was the ship's participation in the RAN 75th Anniversary Fleet Review. Admiral of the Fleet HRH The Prince Philip, Duke of Edinburgh KG KT OMGBE reviewed ships from seven nations from the flag deck of HMAS COOK ensuring a very visible role for the Marine Science Force.

### Australian Oceanographic Data Centre

The Hydrographer operates the Australian Oceanographic Data Centre (AODC) and by international agreement is the Australian National Coordinator for the International Oceanographic Data Exchange programme. This programme is operated by the Intergovernmental Oceanographic Commission, an agency of UNESCO. Within the Hydrographic Service, the AODC is responsible for the acquisition, quality control, and archival of oceanographic data and the dissemination of information to the Australian Defence Force and the civilian community.

### Bathothermal Data

The AODC is continuing to acquire ocean temperature data, collected using Expendable Bathythermograph probes (XBT's). This year approximately 5,000 XBT observations have been received, with the majority coming from the RAN and RNZN. This data will be added to the national bathothermal data bank when the oceanographic computer facility becomes operational at some stage in the future.

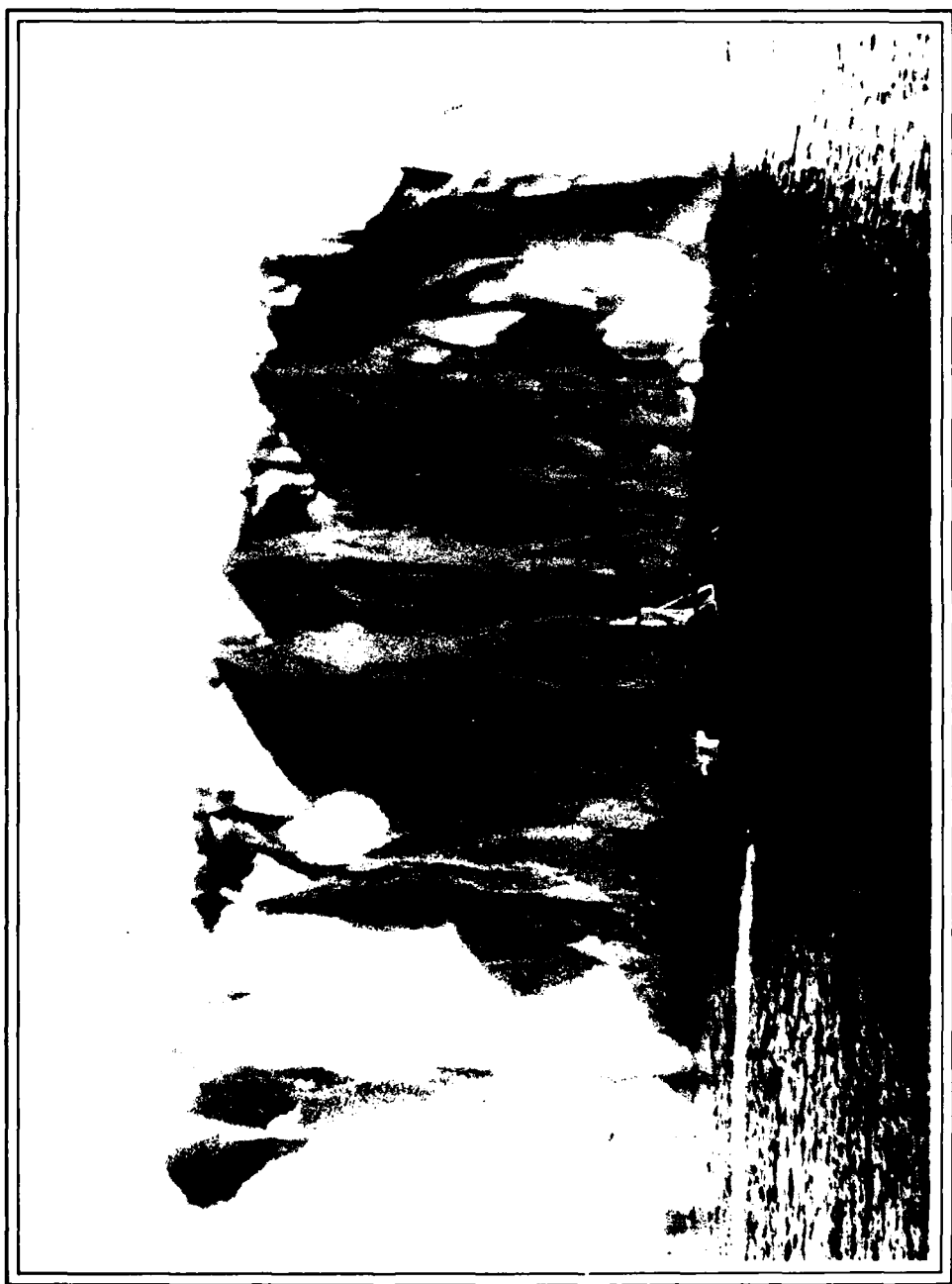
Under an agreement with the United States National Oceanographic Data Center (NODC) the AODC has been forwarding analogue XBT traces, from both the RAN and RNZN, to be converted into a digital form. To date, over 14,000 XBT observations have been digitised by the US NODC. In order to meet his international responsibilities the Hydrographer requests that this data be included in the World Data Center 'A' (Oceanography) data archive. When the necessary computing and manpower resources become available the AODC will process all Australian collected data.

The AODC is presently making efforts to acquire, on loan, a micro computer from the US National Oceanic and Atmospheric Administration (NOAA) to overcome the lack of in-house computing support. This system will assist with the automation of the quality control of XBT data and has been specifically developed for this task. The system is called the Quality Improvement Profile System (QUIPS).

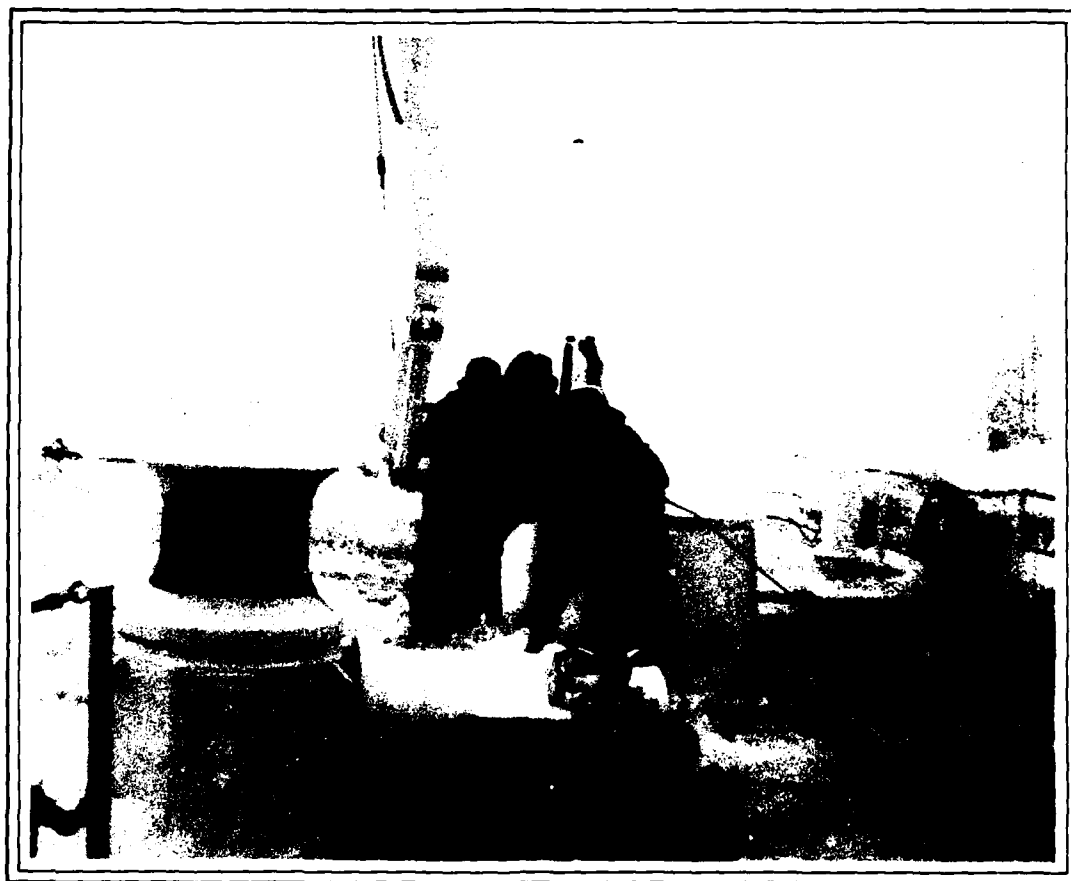
### Services

During the year the AODC continued to provide limited information to Defence. This included reports covering the oceanographic and meteorological conditions affecting Naval operations for major exercises and various ship deployments. Additional information was provided to a number of defence agencies and directorates covering a range of marine science related topics.





END OF LINE! DETACHED SURVEY UNIT IN THE ANTARCTIC



ALL IN A DAY'S WORK  
OCEANOGRAPHIC STATION, SOUTHERN TASMAN SEA - HMAS COOK

The AODC received a large number of requests for information and data from both within Australia and from overseas. Major requests came from the following agencies :-

1. N.S.W. Department of Agriculture, Fisheries Research Institute.
2. ABC National History Unit.
3. Department of Agriculture, Fisheries Research Institute, New Zealand.
4. National Institute of Oceanography, Physical Oceanography Division, India.
5. Ministry of Lands, Energy and Mineral Resources, Fiji.

A number of requests from both Defence and civilian agencies could not be completed due to the lack of resources.

#### **AODC International Activities**

**IGOSS.** The AODC has continued its involvement with the Integrated Global Ocean Services System (IGOSS) programme of the IOC as a result of the Hydrographer's responsibility as the National Representative for IGOS. Efforts are underway to establish a Specialised Oceanographic Centre (SOC) as a cooperative venture with the Bureau of Meteorology. The SOC is intended to manage IGOS data for the South Pacific region. Access to this real-time data is of interest to a wide range of users including search and rescue, fisheries and defence. CSIRO, Division of Oceanography have already expressed considerable interest in this proposal. The implementation of the SOC is dependent on the development of the Hydrographer's oceanographic computer facility and other necessary resources.

**IODE.** The AODC has had limited involvement in the IOC's IODE programme this year. A National Report on IODE activities was submitted to the Twelfth Session of the IOC Working Committee on IODE held in Moscow during December, 1986. Attendance at this meeting was not possible due to a lack of funds.

In June, 1987 the Officer in Charge of AODC acted as a consultant for the IOC in a Mission on IODE matters to Thailand, Philippines, Indonesia and Malaysia. This Mission examined the oceanographic data management infrastructure in each country and made recommendations on ways of improving data management and increasing national involvement in the IODE programme. The findings of the Mission were reported to the Fourth Session of the IOC Regional Committee for the Western Pacific (WESTPAC IV) held in Bangkok, 22-26 June, 1987.

The AODC is distributing nationally a number of data and information products developed within Australia or obtained internationally from IGOS or other IOC programmes. These include :-

1. Western Tasman Oceanographic Analysis Charts produced by the Naval Weather Centre, NAS Nowra.
2. Global Sea Surface Temperature Charts produced by the Satellite Data Services Division of NOAA.
3. Monthly Sea Surface Temperature and Temperature Anomaly charts covering the Canadian area of interest produced by the Marine Environment Data Service as an IGOS product.
4. Monthly Mean Sea Level in the Pacific and Sea Level Anomaly charts, produced by the IGOS Sea Level Pilot Project/Specialised Oceanographic Center (ISLPP/SOC) in Hawaii.

#### **Facilities**

The AODC is continuing to use a commercial computing bureau to provide limited computing support. Efforts are underway to develop an in-house computer facility that will enable the AODC to meet its responsibilities more fully. The present lack of adequate computing facilities is restricting activities and limiting the AODC's capabilities. For this reason there has been little progress in processing, archiving and distributing data collected by HMAS COOK.

Recent staff changes have also caused a number of difficulties. Due to the specialised nature of AODC's functions suitably qualified staff are difficult to recruit and require considerable training and experience before becoming fully productive. The possibility of acquiring additional staff to manage the rapidly increasing volume of data and to provide the necessary services is low.

#### **Naval Weather Centre, RAN Air Station, Nowra (HMAS ALBATROSS)**

The Naval Weather Centre (NWC) continues to provide both aviation and maritime units with extensive environmental support on request. During the period July 1986 to June 1987 the output of the NWC has increased by 54%, with the majority of the increase requested by Fleet Units.

#### **Meteorological Forecasts**

During the period July 1986 to June 1987 the number of signals emanating from the NWC in response to specific requests for meteorological and climatological forecasts and data, totalled 11754, an increase of 19.2% over the previous twelve months. Some of this increase can be attributed to an intense period of activity during RAN 75th Anniversary celebrations when multi-national Fleet Exercises were held and comprehensive environmental support was provided to all participants.

#### **Oceanographic Forecasting**

Demand for both the weekly Western Tasman Sea oceanographic analysis and Acoustic Sonar Range Predictions (AUSRAPs) continues to grow, with AUSRAP requests increasing by 110% during the last twelve months.

Real time oceanographic data continues to be sparse with the major contributors being RAN Fleet Units and CSIRO. Hard copy colour enhanced computer imagery obtained from satellite information is now obtained from CSIRO Aspendale.

A billet has now been established for a dedicated Oceanographic Officer and when filled a weekly analysis of the West Australian Exercise Area will be instigated.

The Hydrographic Survey of Australia is a continuous process, and the results of the survey are used to produce charts and other navigational aids. The survey is conducted by the Australian Survey Office, which is part of the Department of Defence. The survey is conducted in a systematic manner, covering the entire coastline of Australia and its surrounding waters. The results of the survey are used to produce charts and other navigational aids, which are then used by the Australian Navy and other maritime forces. The survey is also used to provide information to the public, such as the location of reefs and other hazards. The survey is a vital part of the Australian maritime infrastructure, and it is essential for the safety and security of the nation's waters.

The volume of hydrographic information arriving at the Office for the year has again exceeded the processing capacity to apply the information to charts. The volume of information received for 1986/87 was 983 survey documents affecting over 640 charts. This compares with 246 documents affecting 81 charts 10 years ago. While some 157 charts were revised for the year, this does not reflect the extent of the revision required or the cumulative back log not addressed for past years.

Staff resources applied to chart compilation and production have been low compared to the magnitude of the task. Subordinate technical staff have been difficult to obtain and require up to two years experience and training before satisfactory production can be achieved. Cartographic production staffing figures have remained overall much lower than establishment of the Branch and the end of year cartographic manpower realised only 75% of establishment.

Production of charts for the year has been major building modification disrupting charting services. This has been caused by disruption to the computer system, caused by delays in the progress of building alterations and subsequent re-arranging of computer facilities following necessary shut-down. The completed works package has provided a more secure and functional data management and production facility.

Production of charts for the year has proceeded with 48 completions in hand. The means of converting vector data into reproducible material for printing has proved very difficult due to the inadequacy of current digital cartographic standards. This has also affected the transfer of other digital data for chart use. In particular, digital bathymetric data remains difficult to use, given that suitable coastal data can be found in the first place. The Australian Standard A1000 is not suitable for coastal charting.

The use of satellite derived data from the LANDSAT program has increased throughout the year. The main advantage of this data is derived from the analysis for depth of penetration. This has provided the means of improved knowledge of coverage of charted areas that assist small craft and surveillance operations. Although the information is not suitable for hydrographic survey, it is considered an essential part of survey and chart planning. Progress in the use of satellite data provides the chart user with correct spatial relationship of near surface features and reasonably accurate bathymetric data.

The use of satellite data has been difficult in supporting charting in Papua New Guinea and in the Solomon Islands. The processing of this information has been hindered by the Australian Survey Office's limited capacity to handle the large volume of data. The Hydrographic Survey of Australia is a continuous process, and the results of the survey are used to produce charts and other navigational aids. The survey is conducted by the Australian Survey Office, which is part of the Department of Defence. The survey is conducted in a systematic manner, covering the entire coastline of Australia and its surrounding waters. The results of the survey are used to produce charts and other navigational aids, which are then used by the Australian Navy and other maritime forces. The survey is also used to provide information to the public, such as the location of reefs and other hazards. The survey is a vital part of the Australian maritime infrastructure, and it is essential for the safety and security of the nation's waters.

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### **Chart Distribution**

During 1986/87 the Chart Distribution Centre has had two relocations within the building so that renovations could be carried out to provide the much needed space for the Hydrographic Office's expanding requirements. These movements caused some disruption to the service but every endeavour was made to keep delays in supplying charts to a minimum.

There has been some difficulty in securing staff for the Distribution Centre. The section has been understrength by three for a considerable part of the year. Having experienced and stable staff can partly make up for vacant positions and the efforts of all concerned in working under difficult circumstances during the various office moves have been very much appreciated.

The HYDROSTOK computer system has had software changes that enable better reporting and recording of chart sales and issues information. The machine continues to be a useful and efficient device that supports the operations of the Chart Distribution Centre.

The chart agency network has expanded this year with 81 outlets in Australia and 12 Overseas giving a total of 93.

During the financial year 1986/87, the total sales of charts and publications was \$813,191, a decrease of \$7,634 (1%) over the previous year. The total return to the Commonwealth has increased due to more sales tax being collected. Further details of the year's turnover can be found at Appendix IV.

The 1987 ANTT was distributed through AGPS. The turndown in items sold and monies recovered reflects this change in marketing. Some \$45,000 in sales of tide tables was recovered through the AGPS trust fund account.

### **Records and Library**

The Hydrographic Office Records and Library section provides a specialised service supporting hydrographic and oceanographic activities within Australian states and territories and overseas.

During the year survey sheets were received from the RAN Survey Units and other sources as listed in Appendix III.

The Library has also sent 19 Records of Survey to Australian Archives at Villawood.

The position of temporary Library Officer Grade 2 has been filled, releasing the previous Library Officer to Librarian Grade 2 to establish an information system.

During the past year, the Library has received books to the value of \$2,366 and over \$2,000 in periodical subscriptions.

Through Defence Information Service, the library has received inter-library loans for its users and supplied inter-library loans to other libraries. In mid 1988, the Library will receive an on-line computer terminal which will be used to simplify library administration.

## SURVEY SUPPORT

### General

The Survey Support section of the Hydrographic Office serves both cartographic and operational aspects of the Hydrographic Service. Its major ongoing functions include Notices to Mariners and the Tidal Branch. The section is also responsible for quality control of hydrographic data, sailing directions, nomenclature, maritime boundaries and the collation of GEBCO ocean sounding data. Survey Support is the focal point for all external queries of a navigational nature and for liaison with national and international authorities on navigational and hydrographic matters.

Established after the 1984 complement review, the section is staffed both by naval personnel and by civilians, the head of section and three others having recent seagoing command experience. As well as the examination of all incoming data, section staff provide user input to the editing process for all new charts and new editions. Responsibility for the maintenance of standards documentation for hydrographic units rests with the Deputy Director, Survey Support, and during the year work started on the complete revision of 'Australian Hydrographic Instructions' (AHI). A target date of January 1988 has been set for the new publication, which will incorporate all extant orders and memoranda, plus those sections of the Royal Navy's 'General Instructions for Hydrographic Surveys' (GIHS) which have been adopted by the RAN.

Section personnel are also available to provide advice and practical expertise to special projects and other development areas. During the year considerable effort has been spent on the evaluation of the tender responses and Project Definition Studies for the HYDLAPS project. Some work has been carried out to quantify the accuracy of soundings obtained at sea with the object of defining more realistic depth standards. As part of this study, MORESBY and FLINDERS were tasked to carry out a series of trials under controlled conditions to determine the effects of ship squat. MORESBY successfully completed her trials at the end of June, with encouraging results. It should now be possible to model the effects of squat at any speed or water depth, and incorporate the model into HYDLAPS software to provide on-line correction for this effect.

The Quality Control Officer is a member of the implementation team for the Hydrographic Information System (HIS) project.

### Notices to Mariners

The section is now fully staffed with LCDR Mark Bolger RANEM appointed to the vacant Superintendent's position and Mr. George Penon as his Assistant.

Although the quantity of data flowing into the section has shown no decrease, there were fewer Notices issued during the year. This was due in part to a conscious effort to reduce the burden on the mariner and promulgate more information of a less urgent nature by Revised Print action. Queries from other government agencies and the public remain at a high level, and the section archives provide a valuable source of historical data which is regularly accessed.

The number of Hydrographic Notes received during the year from all sources again showed a decrease over the previous year. The reasons for this are not clear.

Full use is made of the personal computer and laser printer acquired by the section in 1986. The system supports word processing, database and desktop publishing applications and is used to compile all Notices and maintain the cumulative lists. Studies are in hand to investigate further automation of Notice to Mariners functions.

Statistics for the period are as follows (1985/6 figures in brackets)

Hydrographic Notes from HMA Ships	82	(112)
Hydrographic Notes from other sources	89	(121)
Notices to Mariners issues	581	(802)
Blocks for Charts	32	(30)
Notes/Cautions for Charts	44	(46)

RAN vessels rendering 5 or more Hydrographic Notes during the year were:

TOBRUK	11
BETANO	9
FLINDERS	6
TOWNSVILLE	5

The remaining 51 Notes were rendered by 24 RAN Units.

### Tidal Branch

The work of the Tidal Branch falls into four distinct categories:

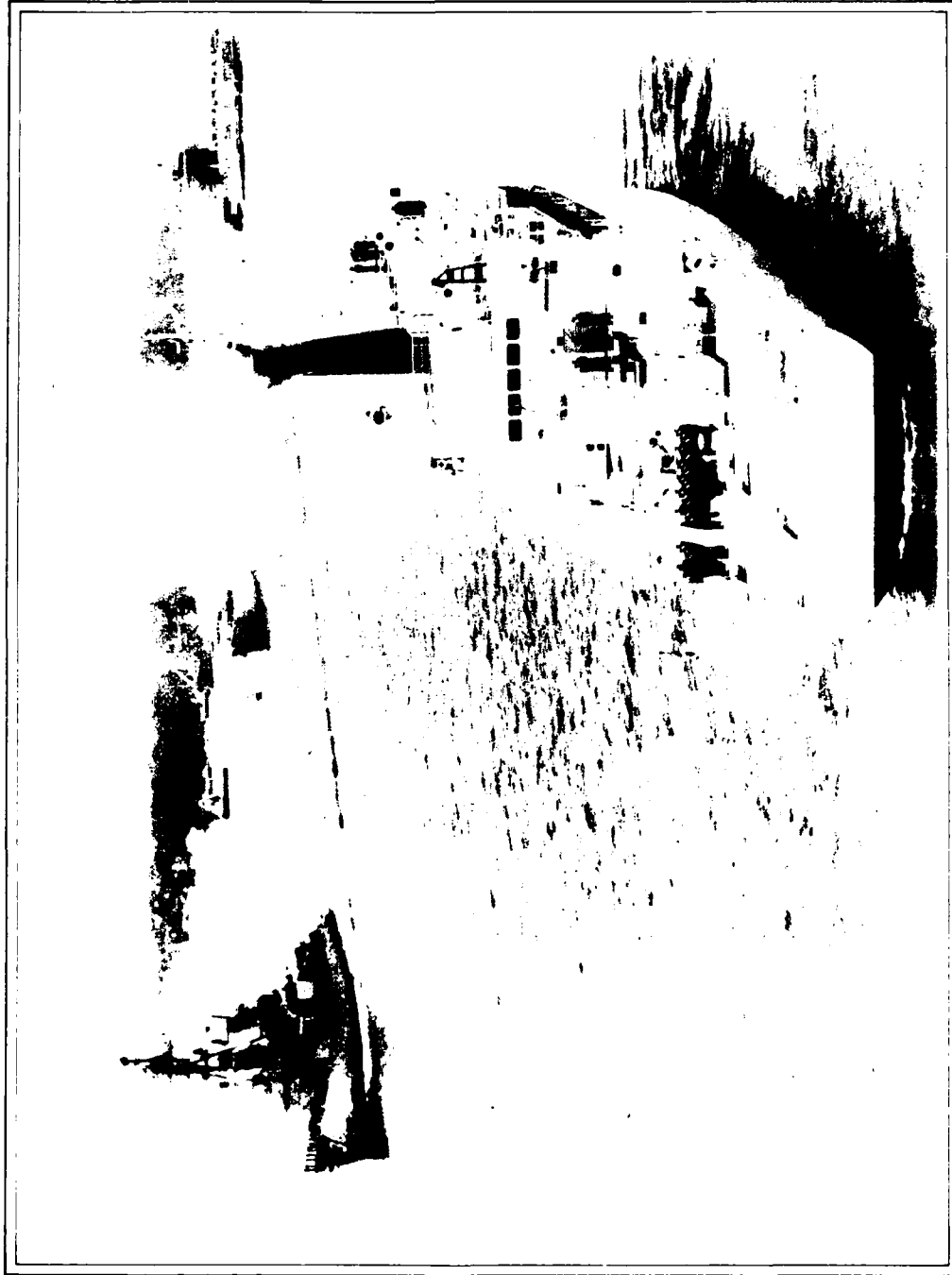
- Production of Australian National Tide Tables (ANTT);
- Support for cartographic work;
- Support for survey operations;
- Special projects and support for external activities.

Mr. Alan Marshall was confirmed in the position of Tidal Officer after carrying out these duties in an acting capacity for several years. The Australian Government Printing Service is now the commercial marketing authority for the Australian National Tide Tables. Predictions for inclusion in the 1987 ANTT were produced by the Flinders Institute for Atmospheric and Marine Sciences (FIAMS) (53 ports), The Institute of Oceanographic Sciences (Bidston, UK) (7 ports), The Department of Marine and Harbours, WA (4 ports), Associated Surveys (1 port) and the Hydrographer of the Navy (UK) (1 port). Predictions for a further two ports were produced by the section.

The 1988 edition of ANTT is in the final stages of compilation and will include tidal height predictions with phases of the moon for 70 standard ports, and one entry for predicted tidal streams.



RAN 75TH ANNIVERSARY REVIEW  
ADMIRAL OF THE FLEET HIS ROYAL HIGHNESS THE PRINCE PHILIP,  
DUKE OF EDINBURGH, KG, KT, OM, GBE EMBARKS IN HMAS COOK



HMAS COOK REVIEWING THE FLEET



The supply of survey datum adjustments for the cartographic sections of the Office continues to be a major task of the branch. The need to recompile many new editions of charts on the LAT datum has required a re-examination of all the original surveys, many of which have datums which are difficult to reconcile with LAT, or for that matter any other modern reference plane. Support for RAN surveys has also posed problems in certain areas, especially in northern waters where the paucity of existing tidal information and the complexity of the tidal regime have made it very difficult to supply robust tidal models at the start of a survey.

The two main areas of development have been the tidal database and the introduction of a unified national tidal datum. Despite the inconvenience of having to change computer systems twice during the year, steady progress has been made in the development of the tidal database and associated applications programs. When complete, the database will contain the constituents for all standard and secondary ports, plus benchmark data and programs for prediction and analysis.

In due course this will lead to the publication of more comprehensive information in the ANTT. Mr. M. Hanigan, who joined the section in 1986 as a technical assistant, has undertaken much of the software development for the database. A suite of BASIC tidal programs for the HP-85 computers in the surveys ships has been completed. It includes a tidal streams analysis program and a very useful co-tidal reduction program suitable for diurnal or semidiurnal waters. These programs can be converted to run on other systems and will be included in the processing software for HY-DLAPS.

Considerable work has been put into the formulation of proposals for the unification of chart datum in the Australian area of responsibility. Although LAT is the preferred datum plane, there are areas of very small tidal range where meteorological effects dictate a datum level below LAT for practical purposes. A discussion paper has been drafted which will be tabled at the August 1987 meeting of the Hydrographic Surveyors Committee of the Association of Australian Port and Marine Authorities, since the agreement of a port authority would be required before any change were made to a port datum. *If a figure of LAT + 0.2 metre is accepted as a realistic target for the first stage of any datum unification program, then there are thirteen Australian ports which will require a datum adjustment.*

The critical area of Torres Strait has been singled out for priority treatment in the datum unification program and a target date for 1 January 1989 has been set for the publication of new LAT editions of the four large scale charts covering the Prince of Wales Channel and its approaches. From that date all tidal predictions for Booby Island, Goods Island, Hammond Island, Thursday Island, Ince Point and Twin Island will be referred to LAT in all relevant tide tables.

The Tidal Officer continues to be an active member of the Permanent Committee on Tides and Mean Sea Level.

## **SYSTEM SUPPORT**

### **ADP Acquisitions**

**Hydrographic Information System (HIS).** The HIS Contract has been awarded to GeoVision Corporation (Aust.) and the first hardware was delivered in May 1987. The concept is of a geographical relational database to store digital hydrographic data to meet user information requests in a timely way.

Hardware comprises two HP 9840 series CPU's with 8MB memory and a total of 1.6 GB of disk storage. Connected by a LAN, the two stand-alone workstations are DEC MicroVax II GPX systems with high resolution 48cm graphic screens. Each will have 4MB memory and 160MB disk space. A high resolution colour raster plotter (400 dpi) will be utilised, and the system will be completed by a range of magtape units, digitisers and printers. Software, based on the GeoVision GIS package, will be tailored for hydrographic data storage and retrieval. Applications software is currently being written by GeoVision and includes contouring, sounding selection, modelling and image analysis.

Project completion is due in the first half of 1988. The Hydrographic Office software support cell has been involved in all phases of the specification of the HIS equipment and software, and will continue to take an active role in system installation and use. A project implementation team has been formed, with members drawn from the cartographic, system support and survey support sections of the Office.

**COOK Data Logger.** HMAS COOK project funds were received to purchase a used HP 1000 computer system to provide a land based system for software support of the ship based system. This was installed with considerable difficulty owing to hardware and operating system incompatibilities.

**Autochart Software.** Software to allow the direct generation of grids and borders as a part of the chart features was purchased. Both Mercator and Transverse Mercator projections are supported.

### **Status of ADP Systems**

Owing to the building renovations, Autochart has been relocated twice during the year. This, coupled with a major operating system revision, has resulted in a significant disruption to the workflow through this charting system.

The HYDROCOMP project will become more aligned with the HIS project to the extent of sharing processing power, peripherals and some software during the initial stages.

HYDROSTOK is functioning with little software support due to the limited scope of the application and lack of complexity of the system.

The five Personal Computers supplied in 1986 are being used in diverse roles. Tasks ranging from word processing through database training to tidal computations have been performed on these machines.

### **Strategic Plan for ADP Support**

No progress has been made on this project due to a staff shortage. The advent of large scale technology upgrades to the Hydrographic workplace will necessitate modification to the manning and funding of systems, software and hardware support in the immediate future.

### **Databases**

The Hydrographic Office is aware of the importance of accurate and accessible digital information. The major focus of the Software Support Cell has been directed toward ensuring that database access can be effected via spatial methods and that the host database is as flexible as possible. Software Support staff have been working with the HIS project team to develop user views and database schemas for digital Hydrographic Survey information. Experience in database design has been developed through training and in-house practical application.

## **PERSONNEL AND TRAINING**

### **Personnel**

The civilian establishment of 100 has not been achieved due to severe staff ceiling pressures however an additional trainee drafting officer's billet was established.

At 30 June 1987 the Terminal Staffing level was reduced to 77 PSA and 2 NDA positions. At that date all positions were filled and 14 restaffing proposals were outstanding. It is expected that 8 of these restaffings will be internal promotions.

(See Appendix V for details of Uniformed and Civilian staffing levels).

### **Training**

#### **Hydrographic Office**

The RAN Hydrographic Office, as the only Australian authority involved, has continued to provide in-house training in manual and digital chart compilation to ensure that charts in the Australian series adhere to the standards of the International Hydrographic Organization. In support of the now internationally recognised Graduate Diploma in Hydrographic Surveying Course at the Australian Maritime College, staff members provided instruction in cartographic procedures to students in Launceston.

One overseas student from the Solomon Islands Hydrographic Unit was given cartographic training which had been arranged through the Defence Co-operation Program.

The introduction of new technology has required that intensive training courses in relational data base management and the "C" programming language had to be provided to selected members of staff.

Staff have been encouraged to undertake part time training at institutions and attend Departmental Development courses. One Drafting Officer attended the 6 month H4 Course at HMAS PENGUIN. All opportunities to participate in familiarization visits to ships and other Defence Establishments have been taken. Three Drafting Officers spent extended periods at sea in HMA Ships MORESBY and FLINDERS.

The Hydrographic Office provided the facilities for instruction and familiarization for Navigation and Underwater Control courses conducted by HMAS WATSON. There has been a steady interest in UC teams from operational ships being briefed by AODC.

Visits by students undertaking cartographic related courses at various educational institutions have been made during the period.

Places have been made available for secondary school students to attend the Hydrographic Office for work experience in the fields of surveying, oceanography, cartography, computer science and administration.

#### **RAN Hydrographic School, HMAS Penguin**

During the year, the School has conducted two H4 Officers Courses of 22 weeks duration, three basic Survey Recorder Courses of 12 weeks duration and one 15 week Advanced Survey Recorder Course. In addition, several minor Equipment application and Survey Refresher Courses have been undertaken. Students from Fiji, Solomon Islands and New Zealand attended the Advanced Course while one New Zealand officer attended the 1987 H4 Course. All other students were RAN personnel.

The School was served by two Survey Motor Boats (SMB's) throughout. School SMB 3411 was detached in support of Antarctic Survey Operations in the period December 1986 to April 1987. Training continued with the assistance of SMB 3410 on loan from HMAS COOK. Two additional HP85 computers have been acquired making five computers available for student use. No other major items of equipment have been acquired during the year.

A major review of the design and documentation of the current H4 and Basic Survey Recorder Courses commenced in June and is due to complete in December 1987. To facilitate this, the H4 Course scheduled to commence in July was cancelled. Given good progress in the documentation effort, the 1988 courses will benefit from increased training efficiency.

#### **Oceanography Training in the RAN**

The Officer-in-Charge of the RAN's Applied Oceanography Centre (AOC) is primarily responsible for the planning and/or provision of all oceanographic training conducted in the RAN. The AOC is located within the Australian Joint Maritime Warfare Centre (AJMWC) at NAS NOWRA and is staffed by a METOC qualified officer of Lieutenant Commander rank.

The four main users of oceanographic training are:

- a. UC category sailors (General Service and Submariners at both basic and advanced level);
- b. SWOC and EXAC officers under training;
- c. Fleet Air Arm (HS817 Sqn, HC723 Sqn), and;
- d. Fleet (PWT, Continuation Training).

To meet this demand the conduct of oceanographic training is split evenly between the Sydney area, primarily at HMAS WATSON and HMAS PLATYPUS, and AJMWC. Because of his geographically remote location OIC AOC shares the Sydney-based instruction with the SWOC METOC (HMAS WATSON), the Oceanographic Staff Officer (Hydrographic Office) and the ASW Faculty staff (HMAS WATSON).

The level of oceanographic training is forecast to increase significantly within the next three years because of the impact of:

- a. training METOC-qualified officers in-country, and;
- b. the introduction of a computer-based, on-board sonar range prediction system.

The former is estimated to require an oceanographic module of between 6 and 8 weeks, probably to be conducted by the Naval Weather Centre. The latter is estimated to require instruction at both the basic and advanced level of the UC and UCSM courses, probably to be conducted in HMAS WATSON, as well as initial instruction to ships' ASW teams as the system is implemented.

#### **RAN School of Meteorology**

Located within the Naval Weather Centre at HMAS ALBATROSS, the RAN School of Meteorology began operations in 1949 when two students undertook the basic observers course. Last year nearly 120 naval personnel passed through the school which now conducts 20 different courses ranging from one half day to 19 weeks duration. The School's primary role is to provide the basic training for RAN Meteorological Observers and to conduct those courses necessary for all advanced category training. During the report period, one basic course of 19 weeks and three advanced wind finding/radiosonde courses of six weeks each were held. These courses are accredited by the Bureau of Meteorology.

As well as observer training, the School instructs naval personnel from a wide variety of specialisations for periods up to four weeks at a time. These include aircrewmen qualifying and refresher courses, Navigating Officers, small ships' Flight Commanders, Electronic Warfare Systems Operators and Junior Officers undertaking application courses which include meteorological theory. As well as the RAN personnel instructed, the recently relocated Parachute Training School has drawn on the School of Meteorology for familiarisation lectures on several occasions.

The School is manned full time by a Training Officer and a Petty Officer. Previously the student body has comprised RAN personnel exclusively, but Army personnel undertook meteorological training during the latter half of 1986 and the first Executive Officers Application Course for Foreign Officers Meteorology Course will be undertaken mid 1987.



OCEANOGRAPHIC TRAINING AT THE RAN APPLIED OCEANOGRAPHY CENTRE



NATIONAL MAPPING COUNCIL 1986 MEETING, SYDNEY  
HOSTED BY THE RAN HYDROGRAPHIC SERVICE.

## APPENDIX I

### SURVEYS UNDERTAKEN JULY 1986 — JUNE 1987

Ship/Unit	Officer in Charge of Surveys	Areas
HMAS MORESBY	CMDR J.W. Leech RAN	Port Hedland Inward Bound Vessels Route S.W. Approaches to Sahul Banks Holothuria Banks Ashmore Reef Montague Sound (Boat Survey)
HMAS FLINDERS	CMDR R.J. Willis RAN  LEUT D.J. Myers RAN (From 7 May 1987)	Star Reefs (PNG)  Woodlark Island (PNG) (Boat Survey) Cape Otway Murray Pass (Kent Gp) Port Giles Bass Strait (Shoal Investigations) Wessel Islands
HMAS BRUNEI	LCDR L.J. Gee RAN  LCDR J.W. Paterson RAN (From 19 December 86)	Bamaga Approaches Cairns North Medium Draught Route (Turtle Gp) Montague Sound (with MORESBY SMBs)
HMAS BETANO	LCDR M.A. Hudson RAN  LEUT R.R. Nairn RAN (From 5 December 86)	Howick Island to Barrow Point (Deep Draught Route) Cairns North Arnhem Land Reconnaissance
HYDROGRAPHIC OFFICE DETACHED SURVEY UNIT	LCDR D.C. Bryce RN	Vanuatu Bathymetric Survey Approaches to Mawson Base
RAN HYDROGRAPHIC OFFICE	CMDR R.A. Cotton RN (HMAS BENDIGO)  WOSR K. Slade (HMAS WOLLONGONG)  SBLT J. Kirby-Eaton	Torres Strait. Alert Patches  Shoalhaven Bight  Athol Bay, Sydney Harbour

Details of the areas covered by these surveys can be seen in Plates I XVIII. Copies of surveys can be provided by request to the Director, RAN Hydrographic Office, North Sydney.

## APPENDIX II

### CHART PRODUCTION

#### DRAWING OFFICE PRODUCTION

	1984/85	1985/86	1986/87
New chart published for general use	8	9	5
New editions for general use	16	37	14
Modified facsimiles of BA Charts	3	2	1
Notice to Mariners block corrections	15	18	32
New charts/diagrams for RAN use	10	12	19
Miscellaneous charts	-	2	1
Miscellaneous work orders processed	95	95	75
Stock replenishment (Reprints & Revision)	334	389	370

- Note: 1. The seventy five work orders processed by the Cartographic Section comprise reproductions of charts, diagrams, graphics, forms, grids, certificates and publication material, prepared for the Department of Defence and the Fleet.
2. There were 29 facsimile reproductions of Australian published charts printed by the United Kingdom Hydrographic Department during the period.

#### CHART PRINTING

	1984/85	1985/86	1986/87
New charts	8	9	5
New editions	16	37	14
Revised charts	167	243	164
Reprinted charts	94	146	206
Facsimile reproductions	0	2	0
Modified reproductions	3	2	1
Charts for Fleet purposes	3	4	4
Miscellaneous charts	-	-	1

Chart printing by RA Survey Regiment Bendigo, Victoria 396 charts, 174 550 copies.



# CHART STATISTICS 30-6-87

CATEGORY/SCALE	PUBLISHED IMPERIAL	PUBLISHED METRIC	TOTAL PUBLISHED	PLANNED
Aus. PNG 1:150 000	28	48	76	200
Aus. PNG 1:300 000	48	11	59	101
Aus. PNG Antarctica 1:1 000 000	5	3	8	35
Aus. PNG, Antarctica 1:500 000 and smaller	2	1	3	8
Large scale 1:5 000 to 1:100 000				
Aus.	23	86	109	187
PNG.	27	2	29	38
Antarctica	2	0	2	2
Territories & Reefs	2	1	3	11
International charts 1:3 500 000	0	6	6	6
International charts 1:10 000 000	0	1	1	1
International charts 1:1 500 000	0	0	0	19
PC (Pleasure Craft Charts)	2	5	7	12
RAN Fleet Charts (60 000 series)	23	10	33	40
Diagrams (5 000 series)	19	12	31	40
Totals:	181	186	367	700

Included in the above figures are twenty four charts of British Admiralty origin (imperial measurement) of various scales. These charts are now included in the Australian series under the UK-AUS charting agreement of 1947. They are maintained and reproduced as modified facsimiles with the British Admiralty chart number replaced by an Australian chart number of an equivalent planned series.

The United Kingdom Hydrographic Department continues to maintain 53 of their originally published charts in the Australian area of charting responsibility. These charts are included in the planned totals above under their respective series.

## DESCRIPTIONS OF NEW CHARTS

### Aus 519 Ward Hunt Strait to Star Reefs (published 14-11-86)

This chart falls within the planned PNG 1:150 000 scale series. It was designed following HMAS FLINDERS' survey of 1986 to provide a deep water passage from Ward Hunt Strait northward through the shoals and drying areas of Star Reefs into the north western portion of the Solomon Sea. Rectified Landsat imagery was used to delineate the submerged and drying reefs surrounding Star Reefs Passage. The actual area surveyed and considered safe for navigation is supported by a magenta broken line boundary. All other areas of the chart are noted and considered dangerous for navigation.

### Aus 751 Houtman Abrolhos and Geelvink Channel (published 24-11-86)

At scale 1:150 000 this is another product in the planned Australian series of standard navigation charts. Situated on the south-western coastal area of Western Australia it adjoins chart Aus 752 published in June 1985. The chart portrays the deep water channel between Geraldton and the Houtman Abrolhos Islands and reefs, a distance of approximately 40 NM. Included on the chart are plans of Port Gregory (1:20 000), Recruit Bay (1:50 000) and Good Friday Bay (1:50 000). This chart now completes the coastal series between latitude 28°10'S and 35°30'S at this scale.

### Aus 416 Montebello Islands to Geraldton (published 17-10-86)

### Aus 417 Geraldton to Cape Leeuwin (published 1-12-86)

Both charts in the planned series 1:1 000 000, together with chart Aus 415 published in June 1986, are significant in providing a means for long distance ocean route planning from the Southern and Central coastal ports of Western Australia northward to the Indonesian Islands. Limited ocean detail has been recorded from the shoreline to the 30 metre contour depth and large scale charts need to be consulted for this information. As a result of the publication of these charts, British Admiralty Charts BA 1055 and BA 1033, published 1883 and 1877 respectively, have been cancelled.

### Aus 4060 (Int. 60) Australasia and Adjacent Waters (published 16-4-87)

Publication of this chart now completes the World International Series developed by the International Hydrographic Organisation (IHO), at scale 1:10 000 000. Australia, as an appointed "producer nation" by the IHO, has now met its current responsibilities to compile and publish specific International Charts. Aus 4060 has immense value as a route planning chart from Australia, north to the Indonesian Islands, Papua New Guinea and the Solomon Islands, eastward to New Zealand and the South Pacific Islands of Vanuatu, New Caledonia, Fiji and Samoa.

## DESCRIPTION OF NEW EDITIONS

### **Aus 380 Port Moresby to Orangerie Bay** (printed 4-7-86)

The chart was updated to include RAN supported surveys and private company surveys from Orangerie Bay, west to Cape Rodney. Satellite imagery was examined and the estimated extent of submerged reefs has been indicated by a danger line symbol in the areas leading to Table Bay and Orangerie Bay. Unsurveyed notes and areas preferred for navigation are suitably displayed on the chart and a reliability diagram has been included. Although this chart is of imperial measurement and would not normally be digitised, this an exception to the rule and total digitization of the chart was effected.

### **Aus 155 Approaches to Melbourne** (printed 27-6-86)

Chart is now a digital edition and includes several coastal area surveys by Public Works Department. Topographic detail was adjusted in accordance with surveyed information. A general update was made in the area of Aus 154.

### **Aus 4603 (Int. 803)** (printed 17-7-86) **Indian Ocean, Australia — North Coast and Adjacent Waters**

General revision was carried out and magnetic variation curves and values updated.

### **Aus 193 Jervis Bay and Approaches** (printed 1-8-86)

Chart is now a digital edition. Topographic detail has been adjusted following corrections to established marker values. Plan of Darling Road was removed to indicate total extent of Naval Exercise Area.

### **Aus 113 Port of Fremantle** (printed 24-10-86)

Digital edition effected. Included are Department of Marine and Harbours' surveys to 1985 of Swan River, the area south of South Molle breakwater to Challenger Harbour, Fishing Boat Harbour, the spoil ground and foul ground south-west of South Molle breakwater. Sounding datum was amended to Port Datum.

### **Aus 237 and Aus 238 Brisbane River** (printed 24-11-86 and 4-12-86)

These charts were revised to include changes to light sectors and leading lines throughout the entrance reaches to the Brisbane River. Both charts were processed for general update of accumulated information.

### **Aus 506 Hood Point to Rothery Passage** (printed 6-1-87)

This chart was revised to include coastal surveys from Burumai Point to Cape Rodney. The total extent of information recorded on this chart has been digitised. Reef and island positions between Toveli Entrance and Rodney Entrance have been adjusted to agree with large scale chart Aus 623. Feature details at various points of the coastline have been adjusted to agree with later topographic mapping. A reliability diagram has been included on the chart.

### **Aus 832 Cape Flattery to Barrow Point** (printed 12-12-86)

Reef positions around Two Mile opening were corrected following HMAS BETANO's observations and information received from the Australian Survey Office. Adjustment of topographic detail was effected for Lizard Island and surrounding islands and reefs. HMAS BETANO and HMAS FLINDERS' Deep Water route survey between Barrow Island and Lizard Island has been included. Other surveys included are the Medium Draft Route south of Nymph Island to Maxwell Reef (HMAS BRUNEL), Lizard Island to Cape Flattery (HMAS FLINDERS) and surveys by HMAS BRUNEL and BETANO further south.

### **Aus 14 Groote Eylandt** (printed 18-5-87)

This chart was updated to include BHP Engineering survey of Connexion Channel, Winchelsea Island (western point) to Burley Shoal. Connexion Island position was adjusted in accordance with latest topographic mapping details. Plan of Milner Bay was affected by the survey and the topographic detail adjusted.

### **Aus 4709 (Int. 709)** (printed 27-3-87) **Southern Ocean, Australia, South Coast**

General revision was carried out and magnetic variation curves and values updated.

### **Aus 4 Approaches to Weipa** (printed 15-5-87)

This chart was revised to include RAN survey of Albatross Bay area south of Wooldrum Point and in the Embley River surveys by the Department of Harbours and Marine, Queensland. Amendments were made to navigation aids and the topographic details of the chart was adjusted in accordance with later mapping information.

# LIMITS OF NEW CHARTS PUBLISHED

Number	Title and Limits	Scale	Published Date
Aus 519	Papua New Guinea -- Ward Hunt Strait to Star Reefs Passage Lat. 8°08'09".2S 9°39'00".0S Long. 149°18'35".8E 150°12'00".0E	1:150 000	14-11-86
Aus 751	Western Australia -- Houtman Abrolhos and Geelvink Channel Lat. 28°10'36".5S 29°03'00".0S Long. 113°23'00".0E 114°56'54".3E Plan -- Port Gregory Lat. 28°10'42".0S 28°12'06".0S Long. 114°13'20".4E 114°15'06".0E Plan -- Recruit Bay Lat. 28°24'12".0S 28°28'48".0S Long. 113°42'37".0E 113°47'00".0E Plan -- Good Friday Bay Lat. 28°40'36".0S 28°45'12".0S Long. 113°45'00".0E 113°49'24".0E	1:150 000  1:20 000  1:50 000  1:50 000	24-11-86
Aus 416	Western Australia -- Montebello Islands to Geraldton Lat. 9°38'00".0S 29°10'20".2S Long. 109°44'00".0E 116°19'48".0E	1:1000000	17-10-86
Aus 417	Western Australia -- Geraldton to Cape Leeuwin Lat. 28°00'00".0S 36°50'03".5S Long. 110°04'10".5E 116°40'00".0E	1:1000000	1-12-86
Aus 4060 (Int. 60)	Australasia and Adjacent Waters Lat. 2°36'16".1S 51°00'00".0S Long. 104°00'00".0E 167°57'55".5W	1:10 000000	16-4-87

# LIMITS OF NEW EDITIONS PUBLISHED

Number	Title and Limits	Scale	New Edition Date
Aus 380	Papua New Guinea -- Port Moresby to Orangerie Bay Lat. 9°23'00".0S 11°08'50".0S Long. 147°04'00".0E 149°52'59".0E	1:300 000	4-7-86
Aus 155	Victoria -- Approaches to Melbourne Lat. 37°48'30".0S 38°01'43".8S Long. 144°40'00".0E 145°06'24".0E	1:37 500	27-6-86
Aus 4603 (Int 603)	Indian Ocean, Australia -- North Coast and Adjacent Waters Lat. 01°00'00".0S 22°00'25".0S Long. 115°10'00".0E 148°30'00".0E	1:3 500 000	7-7-86
Aus 193	New South Wales -- Jervis Bay and Approaches Lat. 34°59'00".0S 35°12'14".2S Long. 150°39'54".0E 151°07'26".3E	1:37 500	1-8-86
Aus 113	Western Australia -- Port of Fremantle Lat. 32°01'47".5S 32°04'26".0S Long. 115°40'48".7E 115°45'44".3E	1:7 500	24-10-86
Aus 237	Queensland -- Brisbane River, The Bar to Lytton Cutting Lat. 27°18'45".0S 27°25'44".7S Long. 153°07'51".2E 153°12'48".0E	1:12 500	24-11-86
Aus 238	Queensland -- Brisbane River Lat. 27°24'37".7S 27°29'03".0S Long. 153°01'09".0E 153°08'59".0E Chart includes plans -- Bulimba Reach 1:7 500, South Brisbane Reach 1:5 000, Town Reach and Shafston Reach 1:5 000, Hamilton Reach 1:7 500.	1:12 500	4-12-86
Aus 506	Papua New Guinea -- Hood Point to Rothery Passage Lat. 9°55'00".0S 10°47'30".0S Long. 147°18'00".0E 148°49'00".0E Plan -- Cheshunt Bay Lat. 10°07'30".0S 10°18'00".0S Long. 148°13'30".0E 148°28'00".0E	1:150 000 1:50 000	6-1-87
Aus 832	Queensland -- Cape Flattery to Barrow Point Lat. 14°16'00".0S 15°13'46".5S Long. 144°30'00".0E 146°03'54".2E Chart includes plans -- Cape Flattery 1:45 000, Howick Group 1:75 000	1:150 000	12-12-86
Aus 14	Northern Territory -- Groote Eylandt Lat. 13°23'30".0S 14°05'30".0S Long. 136°09'00".0E 136°36'11".0E Plan -- Milner Bay Lat. 13°51'03".0S 13°52'12".0S Long. 136°24'30".0E 136°25'21".0E	1:75 000 1:7 500	18-5-87
Aus 4709 (Int 709)	Southern Ocean -- Australia, South Coast Lat. 31°00'00".0S 47°31'00".0S Long. 111°54'00".0E 145°40'00".0E	1:3 500 000	27-3-87
Aus 4	Queensland -- Approaches to Weipa Lat. 12°25'00".0S 12°52'13".0S Long. 141°27'00".0E 141°54'09".0E Plan -- Port of Weipa Lat. 12°39'09".0S 12°42'01".0S Long. 141°48'03".0E 141°53'30".0E	1:75 000 1:15 000	15-5-87

# CHARTS IN PRODUCTION (30th June 1987)

NC — New Chart.  
NE — New Edition.

Chart No	Category	Title	Scale	State
Aus 119	NE	Approaches to Esperance	1:75000	Western Aust.
Aus 59	NC	Plans in Port Dampier		Western Aust.
Aus 195	NE	Port Kembla & Wollongong	1:25000	N.S. Wales.
Aus 58	NC	Approaches to Port Dampier	1:37500	Western Aust.
Aus 112	NE	Approaches to Fremantle	1:37500	Western Aust.
Aus 332	NC	Zuytdorp Point to Geraldton	1:300000	Western Aust.
Aus 763	NC	C. LeGrande to Cape Pasley	1:150000	Western Aust.
Aus 57	NC	Dampier Archipelago	1:75000	Western Aust.
Aus 724	NC	Fog Bay to Port Keats	1:150000	N. Territory
Aus 725	NC	Port Keats to Victoria River	1:150000	N. Territory
Aus 728	NE	Eclipse Island to Cape Voltaire	1:150000	Western Aust.
Aus 320	NC	Browse Island to Adele Island	1:300000	Western Aust.
Aus 828	NE	Palm Islands to Brook Islands	1:150000	Queensland
Aus 260	NC	Broad Sound Channel & Shoalwater Bay	1:75000	Queensland
Aus 613	NE	Marion Reef	1:150000	Coral Sea
Aus 835	NE	Cape Weymouth to Cairncross Islets	1:150000	Queensland
Aus 814	NE	Point Danger to Cape Moreton	1:150000	Queensland
Aus 256	NC	Cleveland Bay & Approaches	1:50000	Queensland
Aus 257	NC	Townsville Harbour & Ross River Entrance	1:7500	Queensland
Aus 54	NC	Port Hedland	1:7500	Western Aust.
Aus 200	NE	Port Jackson	1:20000	N.S. Wales
Aus 207	NE	Approaches to Newcastle	1:25000	N.S. Wales
Aus 294	NC	Endeavour Strait	1:75000	Queensland
Aus 296	NE	Goods Island to Proudfoot Shoal	1:75000	Queensland
Aus 292	NC	Adolphus Channel to Prince of Wales Channel	1:75000	Queensland
Aus 343	NC	Whidbey Isles to Cape Courthope	1:300000	South Aust.
Aus 117	NE	Gage Roads & Cockburn Sound	1:25000	Western Aust.
Aus 236	NE	Moreton Bay	1:75000	Queensland
Aus 248	NC	Port Clinton	1:25000	Queensland
Aus 299	NC	Thursday Island and Approaches	1:12500	Queensland
Aus 52	NC	Entrance Channel to Port Hedland	1:25000	Western Aust.
Aus 467	NC	Cape Leeuwin to Esperance	1:1500000	Western Aust.
Aus 839	NE	Cairncross Islets to Arden Islet	1:150000	Queensland
Aus 701	NC	Vrilya Point to Duyfken Point	1:150000	Queensland
Aus 314	NC	Sahul Banks Western Sheet	1:300000	Timor Sea
Aus 53	NE	Approaches to Port Hedland	1:50000	Western Aust.
Aus 293	NC	Prince of Wales Channel	1:37500	Queensland
Aus 235	NE	Approaches to Moreton Bay	1:75000	Queensland
Aus 822	NE	Port Clinton to Percy Isles	1:150000	Queensland
Aus 614	NC	Herald Passage to Turtle Island	1:50000	Coral Sea
Aus 291	NC	Vigilant Channel	1:37500	Queensland
Aus 476	NC	Mackay to Port Moresby	1:1500000	Queensland/PNG
Aus 4	NE	Approaches to Weipa	1:75000	Queensland

# **DIGITAL CHARTS PUBLISHED (See Plate XXVII)**

The following charts have been processed through the "Autochart" system, which has been in productive operation since 1979. Digital capture of information has been effected for topography, bathymetry, nomenclature and symbol-ogy including navigation aids.

Number	Title	Scale	Published Date	State
Aus 5060	Australian Fishing Zone Limits	1:10000000	NE 14-11-84	--
Aus 4060	Australasia & Adjacent Waters	1:10000000	16-4-87	--
Aus 758	Point D'Entrecasteaux to Point Hillier	1:150000	21-3-80	Western Aust.
Aus 757	Cape Leeuwin to Point D'Entrecasteaux	1:150000	13-2-81	Western Aust.
Aus 105	Wedge Island to Lancelin	1:50000	27-5-81	Western Aust.
Aus 116	Plans in West. Aust. west and south coasts	--	27-5-81	Western Aust.
Aus 756	Cape Naturaliste to Cape Leeuwin	1:150000	5-2-82	Western Aust.
Aus 111	Careening Bay and Approaches	1:7500	20-9-82	Western Aust.
Aus 109	Port of Albany	1:12500	8-6-82	Western Aust.
Aus 110	King George Sound	1:25000	26-1-83	Western Aust.
Aus 118	Approaches to King George Sound	1:75000	17-6-83	Western Aust.
Aus 759	Point Hillier to Bald Island	1:150000	9-3-84	Western Aust.
Aus 336	Cape Leeuwin to King George Sound	1:300000	16-9-84	Western Aust.
Aus 744	Exmouth Gulf with Approaches	1:150000	30-10-84	Western Aust.
Aus 58	Port of Dampier & Approaches	1:75000	NE 18-3-82	Western Aust.
Aus 745	North West Cape to Point Maud	1:150000	31-5-85	Western Aust.
Aus 752	Pelsart Island to Beagle Islands	1:150000	12-6-85	Western Aust.
Aus 755	Cape Peron Cape Naturaliste	1:150000	12-5-85	Western Aust.
Aus 328	Montebello Islands to North West Cape	1:300000	1-12-85	Western Aust.
Aus 115	Port of Bunbury	1:50000	NE 26-6-85	Western Aust.
Aus 32	Cambridge Gulf	1:75000	NE 30-5-86	Western Aust.
Aus 754	Lancelin to Cape Peron	1:150000	30-6-86	Western Aust.
Aus 751	Houtman Abrolhos & Geelvink Channel	1:150000	24-11-86	Western Aust.
Aus 753	Beagle Islands to Lancelin	1:150000	30-5-86	Western Aust.
Aus 415	Cape Leveque to Montebello Islands	1:1000000	24-6-86	Western Aust.
Aus 416	Montebello Islands to Geraldton	1:1000000	17-10-86	Western Aust.
Aus 417	Geraldton to Cape Leeuwin	1:1000000	1-12-86	Western Aust.
Aus 113	Port of Fremantle	1:7500	NE 24-10-86	Western Aust.
Aus 665	Eleanora Bay	1:25000	27-5-81	P.N.G.
Aus 380	Port Moresby to Orangerie Bay	1:300000	NE 1-6-86	P.N.G.
Aus 519	Ward Hunt Strait to Star Reefs Passage	1:150000	14-11-86	P.N.G.
Aus 506	Hood Point to Rothery Passage	1:150000	NE 6-1-87	P.N.G.
Aus 199	Botany Bay	1:12000	1-6-81	N.S. Wales
Aus 198	Approaches to Botany Bay & Port Hacking	1:25000	7-8-82	N.S. Wales
Aus 208	Newcastle Harbour	1:7500	NE 21-12-84	N.S. Wales
Aus 220	Plans in NSW North Coast		NE 7-3-86	N.S. Wales
Aus 193	Jervis Bay & Approaches	1:37500	NE 1-8-86	N.S. Wales
Aus 837	Olinda Entrance to Maer Island	1:150000	10-10-82	Queensland
Aus 836	Cape Weymouth to Olinda Entrance	1:150000	15-8-83	Queensland
Aus 376	Torres Strait	1:300000	3-1-84	Queensland
Aus 244	Plans in Port Gladstone		3-1-84	Queensland
Aus 255	Approaches to Abbot Point	1:25000	31-8-84	Queensland
Aus 821	Hydrographers Passage	1:150000	5-10-84	Queensland
Aus 245	Port of Gladstone	1:25000	16-1-85	Queensland
Aus 246	Approaches to Gladstone	1:37500	29-3-85	Queensland
Aus 237	Brisbane River (Entrance)	1:12500	NE 13-7-84	Queensland
Aus 613	Marion Reef	1:150000	28-6-85	Queensland
Aus 262	Approaches to Cairns	1:20000	NE 26-8-85	Queensland
Aus 377	Bligh Entrance to Eastern Fields	1:300000	1-10-85	Queensland
Aus 238	Brisbane River	1:12500	NE 29-11-85	Queensland
Aus 182	Plans in Victoria, SE coast		26-1-83	Victoria
Aus 181	Approaches to Corner Inlet & Port Albert	1:50000	22-8-83	Victoria
Aus 135	Approaches to Port Melbourne	1:37500	NE 27-6-86	Victoria
Aus 28	Port Darwin	1:25000	NE 12-7-85	N. Territory

### APPENDIX III

#### HYDROGRAPHIC INFORMATION RECEIVED DURING THE YEAR

##### Hydrographic Information Received from RAN Service Sources

<b>HMAS MORESBY</b>	Sketch Survey	Minstrel Channel
	HI 97	Sahul Banks.
	HI 100	Bonaparte Archipelago (Institute Islands)
	HI 102	Port Hedland.
<b>HMAS FLINDERS</b>	HI 101	SW Approaches to Sahul Banks.
	HI 94	Star Reefs (PNG).
	HI 94 (Suppl)	Approaches to Kwaiapan Bay (Woodlark Island, PNG).
	HI 98	Cape Otway, Bass Strait and Wallaroo.
<b>HMAS BETANO</b>	HI 105	Port Giles.
	HI 84	Low Isles to Lizard Island.
	HI 103	Howick Island to Barrow Point (Deep Draught Route).
	HI 104	Two Mile Opening to Three Isles.
<b>HMAS BRUNEI</b>	-	Wessels Reconnaissance.
	HI 2/86	Endeavour Strait.
	HI 106	Claremont Island Recce & Turtle Group (Medium Draught Route).
	HI 103	Howick Island to Barrow Point (Deep Draught Route).
<b>HMAS COOK</b>	HI 110	Cairns North.
	-	Wessels Reconnaissance.
	Oceanic	Sydney-Lyttleton.
	Sounding	
<b>Hydrographic Office Detached Survey Unit</b>		
	HI 96	Vanuatu.
	HI 99	Approaches to Mawson.
	-	Teouma Bay - Vanuatu.
	-	Ocean Bathymetric Survey, Vanuatu.
	-	Athol Bay.
<b>HMAS ENCOUNTER</b>		Wrelads Trials Area.
<b>HMAS CAIRNS</b>		Goods Island.

### Hydrographic Information Received from Non-Service Sources

General Locality	Title or Location of Survey	Source
<b>NEW SOUTH WALES</b>		
Port Kembla	Clarence River	Public Works Dept.
Newcastle	Hunter River North Arm	Public Works Dept.
Newcastle	Catherine Hill Bay	Public Works Dept.
Gosford	Broken Bay	Public Works Dept.
Sydney	Bate Bay	Public Works Dept.
Sydney	Sydney Heads	Public Works Dept.
Sydney	Palm Beach	Public Works Dept.
Sydney	Newport	Public Works Dept.
Sydney	Narrabeen	Public Works Dept.
Sydney	Dee Why	Public Works Dept.
Sydney	Manly	Public Works Dept.
Sydney	South Head	Public Works Dept.
Sydney	Coogee	Public Works Dept.
Sydney	Malabar	Public Works Dept.
Sydney	Kurnell	Public Works Dept.
Wollongong	Shoalhaven River	Public Works Dept.
Wollongong	Shell Harbour	Public Works Dept.
Wollongong	Illawarra	Public Works Dept.
Port Macquarie	Crowdy Head	Public Works Dept.
Port Kembla	Clarence River	Maritime Services Board
Newcastle	Hunter River North Arm	Maritime Services Board
Newcastle	Port Stephens	Maritime Services Board
Newcastle	Cabbage Tree Island	Maritime Services Board
Port Kembla	Bass Point	Pioneer Concrete Pty Ltd





## WESTERN AUSTRALIA

Dampier  
Dampier  
Dampier  
Dampier  
Dampier  
Dampier  
Cockburn Sound  
Fremantle  
Fremantle  
Fremantle  
Seabird  
Geraldton  
Exmouth Gulf  
Norah Head  
Port Hedland  
Port Hedland  
Fremantle  
Port Hedland  
Geraldton  
Funucane Island

Survey  
Gidley Island  
Flying Foam Passage  
Hamersley Shoal  
Angel Island  
Keast Island  
Challenger Sound  
Harbour & Approaches  
Jervoise Bay  
Fremantle Survey  
Survey  
Port Denison  
Bundegi Beach  
Jurien Bay  
Tug Haven  
Clearance Survey  
Inner Harbour  
Harbour Facilities  
Geraldton  
Setting out plan

Australian Survey Office  
Australian Survey Office  
Australian Survey Office  
Australian Survey Office  
Australian Survey Office  
Australian Survey Office  
Australian Survey Office  
Dept. Marine & Harbours  
Dept. Marine & Harbours  
Dept. Marine & Harbours  
Dept. Marine & Harbours  
Dept. Marine & Harbours  
Dept. Marine & Harbours  
Dept. Marine & Harbours  
Pt. Hedland Port Auth.  
Pt. Hedland Port Auth.  
Fremantle Port Authority  
Mt. Newman Mining Co.  
Geraldton Port Authority  
Goldsworthy Mining Co.

## DIVISION OF NATIONAL MAPPING

Shark Bay	Bathymetric Map	National Mapping
Near Fog Bay	Bathymetric Map	National Mapping
Near Shark Bay	Bathymetric Map	National Mapping
Maatsuyker	Bathymetric Map	National Mapping
Ingham	Bathymetric Map	National Mapping
Maria Island	Bathymetric Map	National Mapping
Bruny Island	Bathymetric Map	National Mapping
Greenly Island	Bathymetric Map	National Mapping
The Boxers	Bathymetric Map	National Mapping
Quobba	Bathymetric Map	National Mapping
Killiecrankie	Bathymetric Map	National Mapping
Sandy Cape	Bathymetric Map	National Mapping
Goulburn Island	Bathymetric Map	National Mapping
Junction Bay	Bathymetric Map	National Mapping
Wessel Island	Bathymetric Map	National Mapping
Tas. N.E. Coast	Bathymetric Map	National Mapping
Bundaberg	Bathymetric Map	National Mapping
Stanley	Bathymetric Map	National Mapping
Barton Shoal	Bathymetric Map	National Mapping
Hibernia Reef	Bathymetric Map	National Mapping
Cartier Islet	Bathymetric Map	National Mapping
Benalla Bank	Bathymetric Map	National Mapping
Penguin Shoal	Bathymetric Map	National Mapping
Van Cloon Shoal	Bathymetric Map	National Mapping
Londonderry	Bathymetric Map	National Mapping
Montague Sound	Bathymetric Map	National Mapping
Currie	Bathymetric Manuscript	National Mapping
South of Adelaide	Bathymetric Manuscript	National Mapping
Wynyard	Bathymetric Manuscript	National Mapping
Warragul	Bathymetric Manuscript	National Mapping
Naracoopa	Bathymetric Manuscript	National Mapping
Queenscliff	Bathymetric Manuscript	National Mapping
Gabo Island	Bathymetric Manuscript	National Mapping
Off Coast of Ingham	Bathymetric Manuscript	National Mapping
Ayr	Bathymetric Manuscript	National Mapping
Reef Overlay Near Ingham	Bathymetric Manuscript	National Mapping
Reef Overlay Ayr	Bathymetric Manuscript	National Mapping
North of Arnhem Land	Bathymetric Manuscript	National Mapping
North of Gulf of Carpentaria	Bathymetric Manuscript	National Mapping
Cape Croker	Bathymetric Manuscript	National Mapping
Cape Barren Is.	Bathymetric Manuscript	National Mapping
Neptune Islands	Bathymetric Manuscript	National Mapping
Kingscote	Bathymetric Manuscript	National Mapping
Streaky Bay	Bathymetric Manuscript	National Mapping
Port Lincoln	Bathymetric Manuscript	National Mapping
Barker	Bathymetric Manuscript	National Mapping
Venus Bay	Bathymetric Manuscript	National Mapping
Pelsart	Bathymetric Manuscript	National Mapping
Murchison	Bathymetric Manuscript	National Mapping
Nuyts	Bathymetric Manuscript	National Mapping
Edel	Bathymetric Manuscript	National Mapping
Eucia	Bathymetric Manuscript	National Mapping
Coompana	Bathymetric Manuscript	National Mapping
Near Malcolm	Bathymetric Manuscript	National Mapping
Near Cape Arid	Bathymetric Manuscript	National Mapping
Near Burnabblle	Bathymetric Manuscript	National Mapping
Near Coompana	Bathymetric Manuscript	National Mapping
Near Noonara	Bathymetric Manuscript	National Mapping
Yanchep	Bathymetric Manuscript	National Mapping
Fremantle	Bathymetric Manuscript	National Mapping
Fog Bay	Bathymetric Manuscript	National Mapping
Gould Reef	Bathymetric Manuscript	National Mapping

## OVERSEAS

Papeete	Oceanic Sounding	S.H.O.M.
Noumea, Suva	Oceanic Sounding	S.H.O.M.
Kerguelen Plateau	Oceanic Sounding	Bureau of Mineral Resources
Noumea	Oceanic Sounding	S.H.O.M.
Solomon Islands	Honiara, Lungga Point to Tenura Bay	Solomon Island Hydrographic Unit
Papua New Guinea	Umuda Island	OK Tedi Mining Ltd
Papua New Guinea	Port of Biella	PNG Harbours Board
Papua New Guinea	Port of Oro Bay	PNG Harbours Board
Papua New Guinea	Port Moresby	PNG Harbours Board
Papua New Guinea	Port of Kimbe	PNG Harbours Board
Papua New Guinea	Wewak Hydro Survey	Land & Marine Pty Ltd

## TOPOGRAPHIC MAPS RECEIVED: (incl. Orthophotomaps)

Published by:	Central Mapping Authority	5
	S. Australian Dept. of Lands	24
	W. Australian Dept. of Lands & Surveys	1
	Dept. of Surveying & Mapping Perth	25
	Division of Surveying & Mapping Melbourne	9
	National Mapping	33
	RASC	337
	Sunmap	6
	TASMAP Dept. of Lands	26

## LANDSAT IMAGERY RECEIVED FROM AUSTRALIAN CENTRE FOR REMOTE SENSING

Flinders Reefs  
Flora & Holmes Reefs  
North Coast of N.T.  
Papua New Guinea  
East of Innisfail  
East of Cairns

## LANDSAT IMAGERY RECEIVED FROM AUSTRALIAN SURVEY OFFICE

Ward Hunt Strait (PNG)  
Ashmore Reef  
Trobriand Island  
Moore Reefs  
Dianne Bank  
Willis Group  
Herald Cays  
Coringa Islets  
Magdelaine Keys  
Malay & Abington Reefs  
Saumarez Reefs  
Frederick Reef  
Bougainville Reef  
Osprey Reef  
Eastern Field

## PUBLISHED CHARTS RECEIVED

Location		
Western Aust	America's Cup Edition	Dept. Harbours & Marine
Western Aust	Ocean Reef to Cape Peron	Dept. Harbours & Marine
Western Aust	Seabird	Dept. Harbours & Marine
Western Aust	Port Denison	Dept. Harbours & Marine
Western Aust	Trigg	Dept. Harbours & Marine
Queensland	Daniel Island Point	SUNMAP Centre QLD

# **APPENDIX IV** **DISTRIBUTION AND SUPPLIES**

Volume of sales and distribution of charts and associated publications:

	<u>1984/85</u>	<u>1985/86</u>		<u>1986/87</u>	
			Totals	Sales	Issues
Australian	156966	151484	151803	124680	27123
British Admiralty	27226	22873	20693	14658	6035*
New Zealand	1534	954	1182	918	264
Canadian	89	177	100	70	30
	<u>185815</u>	<u>175488</u>	<u>173778</u>	<u>140326</u>	<u>33452</u>

\* Includes BA charts that have been returned for re-use by the Fleet

Value of sales of charts and associated publications (Not including Sales Tax.)

	\$	\$	\$
Australian	686194	682673	706589
British Admiralty	96326	136088	104301
New Zealand	1468	1615	1846
Canadian	605	449	455
	<u>784593</u>	<u>820825</u>	<u>813191</u>

## **Financial Resume**

	\$	\$	\$
Value of goods sold (Net)	784523	820825	813191
Sales Tax recovered	35793	50419	62048
Postage and Freight recovered	9965	9553	8518
Total return to Commonwealth on year's transactions	<u>830051</u>	<u>880799</u>	<u>883757</u>

Retail Chart Prices as at 30/6/87 (Includes Sales Tax)

	<u>1984/85</u>	<u>1985/86</u>	<u>1986/87</u>
	\$	\$	\$
Australian	9.81	10.36	10.60
British Admiralty	14.53	19.46	22.47
New Zealand	6.70	9.85	12.23
Canadian	7.10	7.26	7.26

## APPENDIX V

### UNIFORMED AND CIVILIAN STAFFING LEVELS

#### Uniformed

##### A) Hydrographic Survey Specialists.

The numbers of hydrographic specialists in the Hydrographic Service on 30 June 1987 were as follows. (Figures at 30 June 1986 in Brackets):

Rank/Rating	Billets	Bearing	See Notes
Captain	2	2 (2)	
Commander	4	4 (3)	
Lieut. Commander	9	7 (10)	
Lieutenant	16	21 (16)	1
Sub Lieutenant	0	3 (7)	
WOSR	1	1 (1)	
CPOS	5	6 (5)	2
POS	9	9 (8)	
LSS	15	17 (14)	
ABSR/SMS	29	33 (43)	3
Totals	90	103 (109)	

- Notes:
1. One LEUT RN/RAN Exchange.
  2. One CPOS in adviser to Solomon Island Hydrographic Unit, and another is adviser to the Vanuatu Hydrographic Unit.
  3. Figure for ABSR/SMS does not include 6 on ABSR course on 30-6-87
  4. There is a total of 12 reserve officers with hydrographic qualifications

##### B) Meteorological and Oceanographic Specialists

The number of METOC specialists on 30 June 1987 were:

Captain	0	(1)	
Commander	5	(4)	
Lieut. Commander	6	(6)	
Lieutenant	5	(4)	
WOM	1	(0)	
CPOM	3	(3)	
POM	5	(5)	
LSM	11	(11)	
ABM	25*	(30)	1* + 9 on course
SMM	3*	(0)	

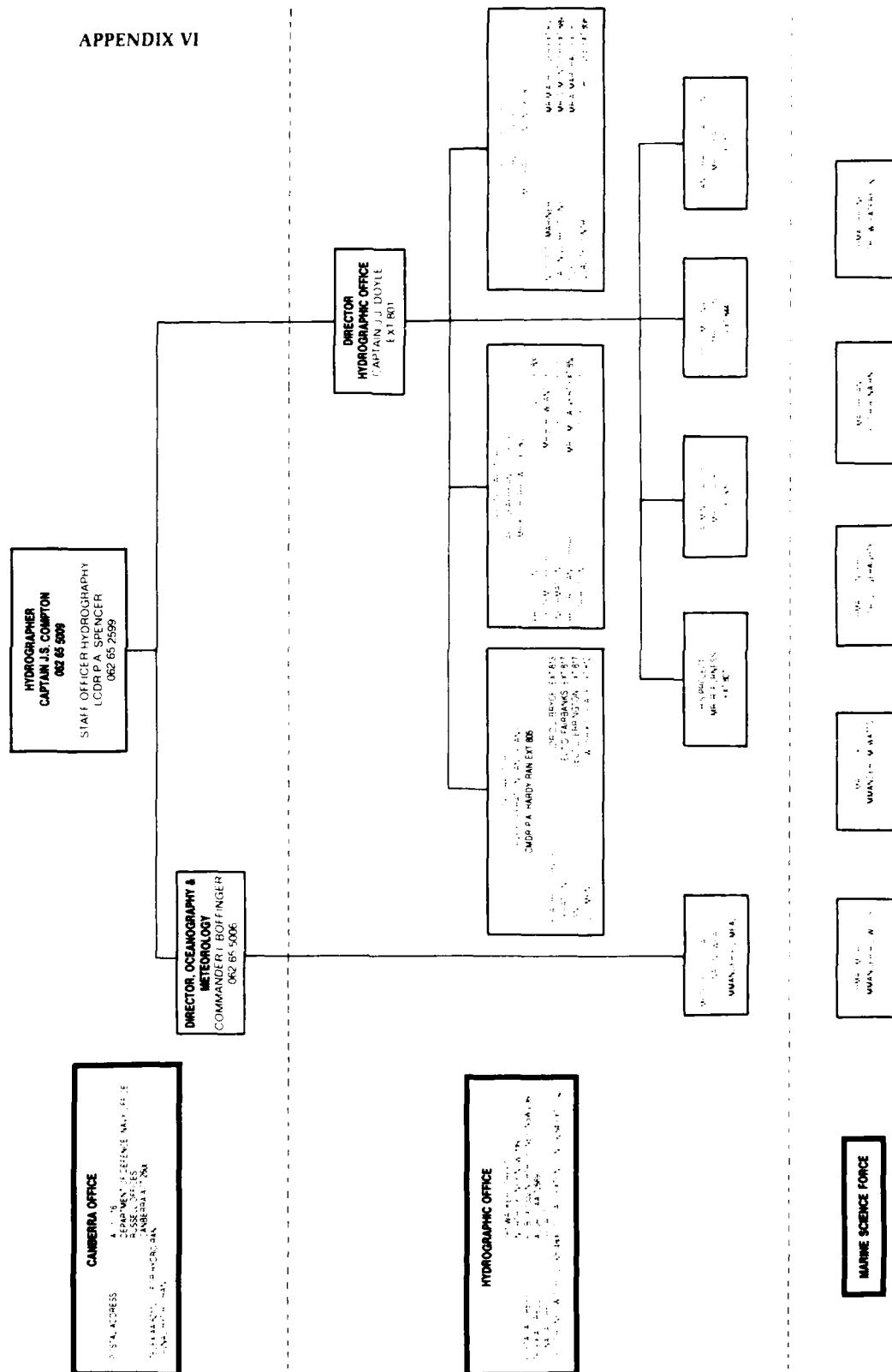
Totals: Officers 16 Sailors 48

#### Civilian

The following civilian members were employed in the Hydrographic Service on 30 June 1987.

	Establishment	Terminal Staffing Level	Manning
Cartographic	57	37	42
Cartographic Trainer	1	2	2
System Support	10	9	8
Distribution	13	12	10
Administration	7	7	6
Survey Branch	6	6	6
Science Branch	4	4	3
Naval Defence Act	2	2	2
	<u>100</u>	<u>79</u>	<u>79</u>

## 2



7

**APPENDIX VII**  
**EXPENDABLE BATHYTHERMOGRAPH RETURNS**  
 (for period 1/7/86 - 30/6/87)

**RAN SURFACE UNITS**

SHIP	DEPLOYED	ACCEPTED	% SUCCESS
ADELAIDE	256	204	80
CANBERRA	327	274	84
DARWIN	254	207	81
DERWENT	275	188	68
HOBART	188	154	82
PARRAMATTA	310	227	73
PERTH	401	319	80
SWAN	224	188	84
SYDNEY	279	205	73
STUART	199	173	87
TORRENS	509	439	86
COOK	447	294	66
Total	3669	2872	78%
MORESBY	59		
CAPE PELLAR	145		
SPRINGTILLY	18		
Total	222 Deployed		



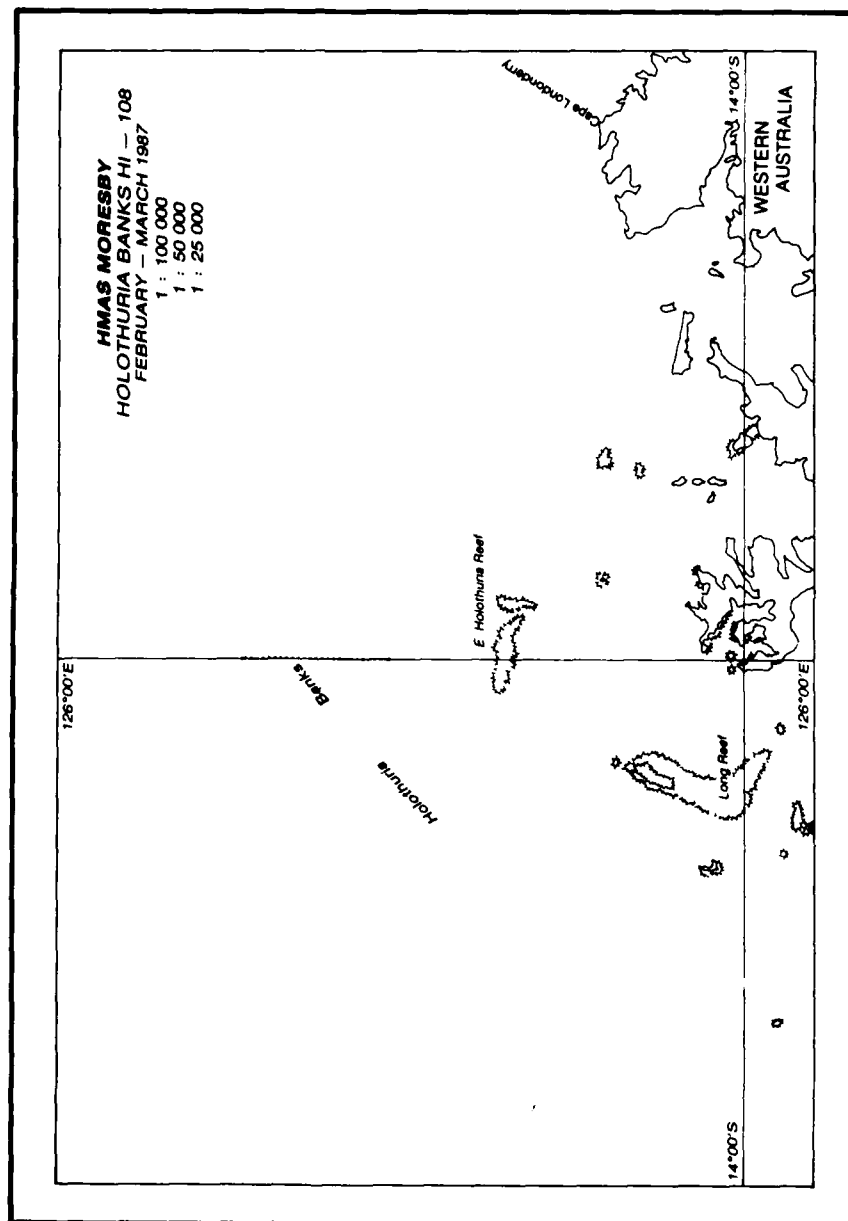


PLATE 1

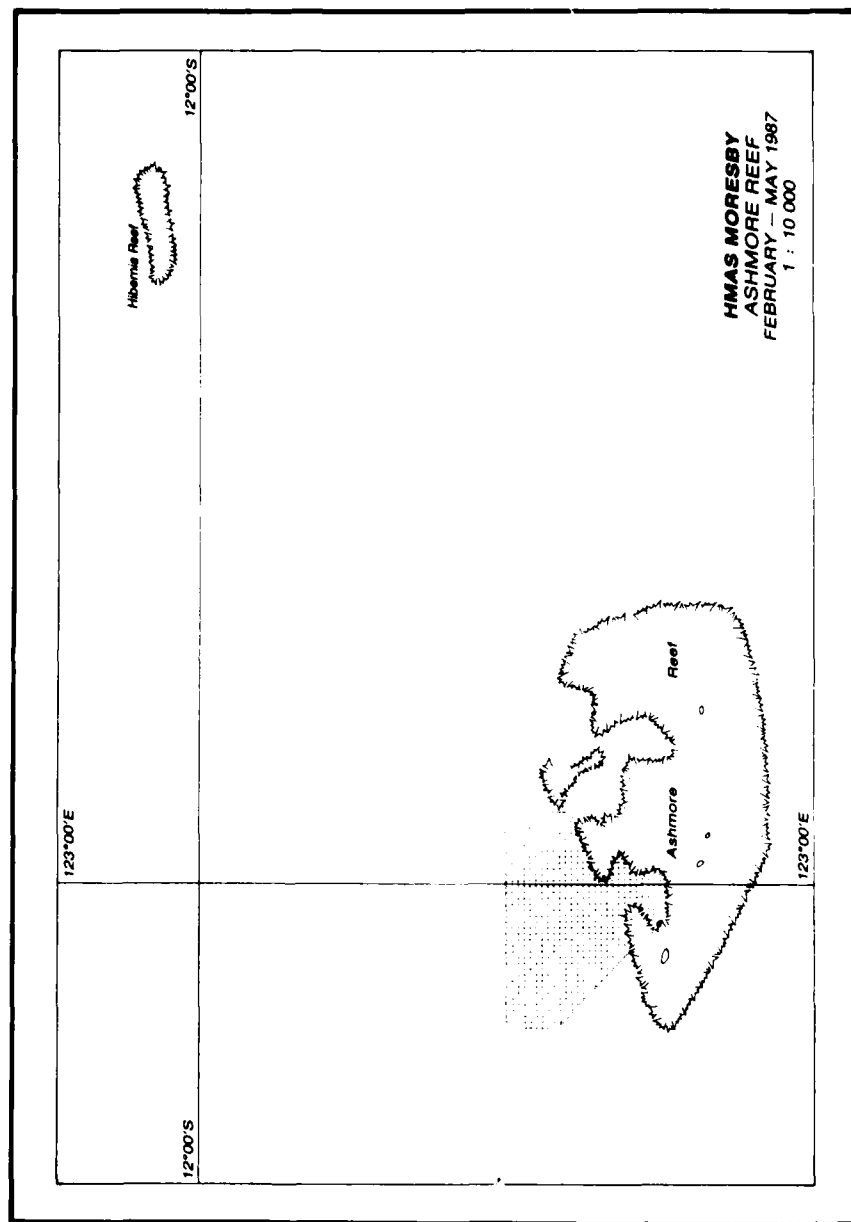


PLATE II

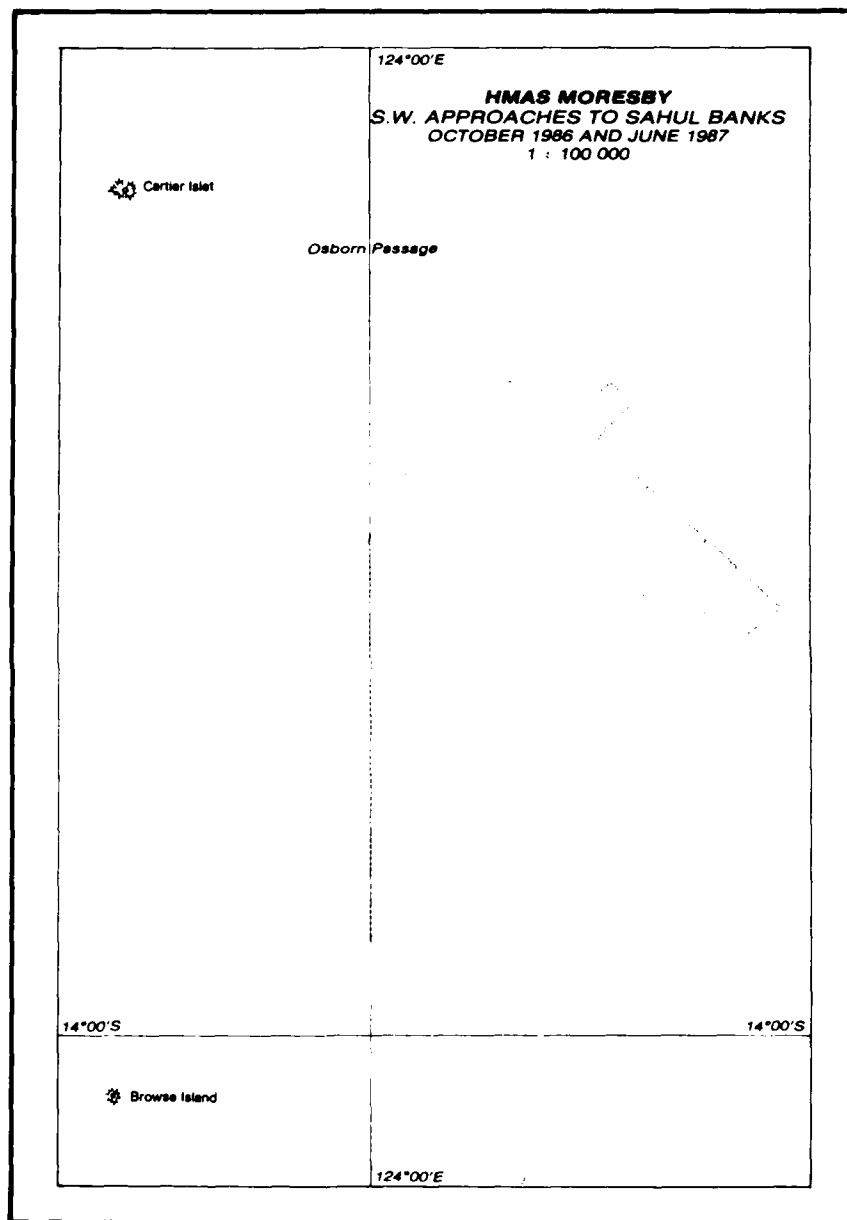


PLATE III

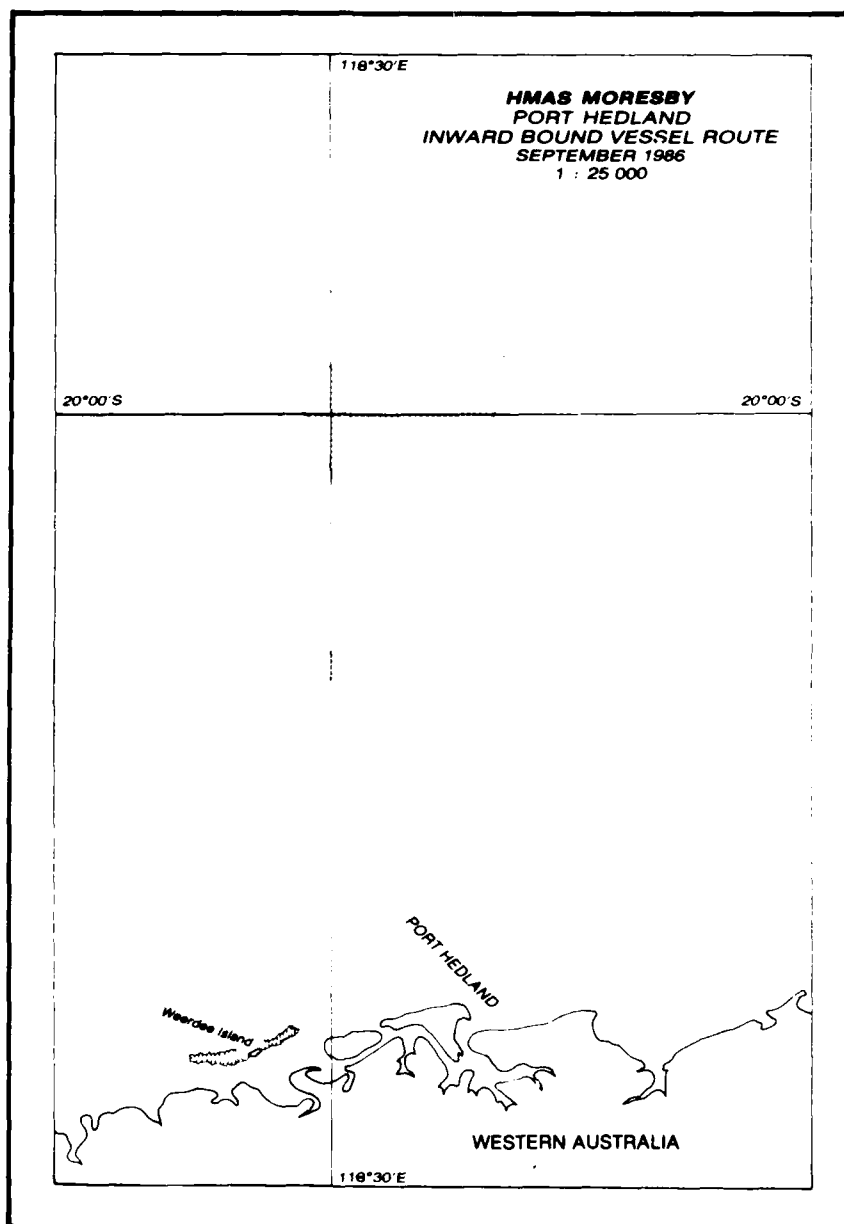


PLATE IV

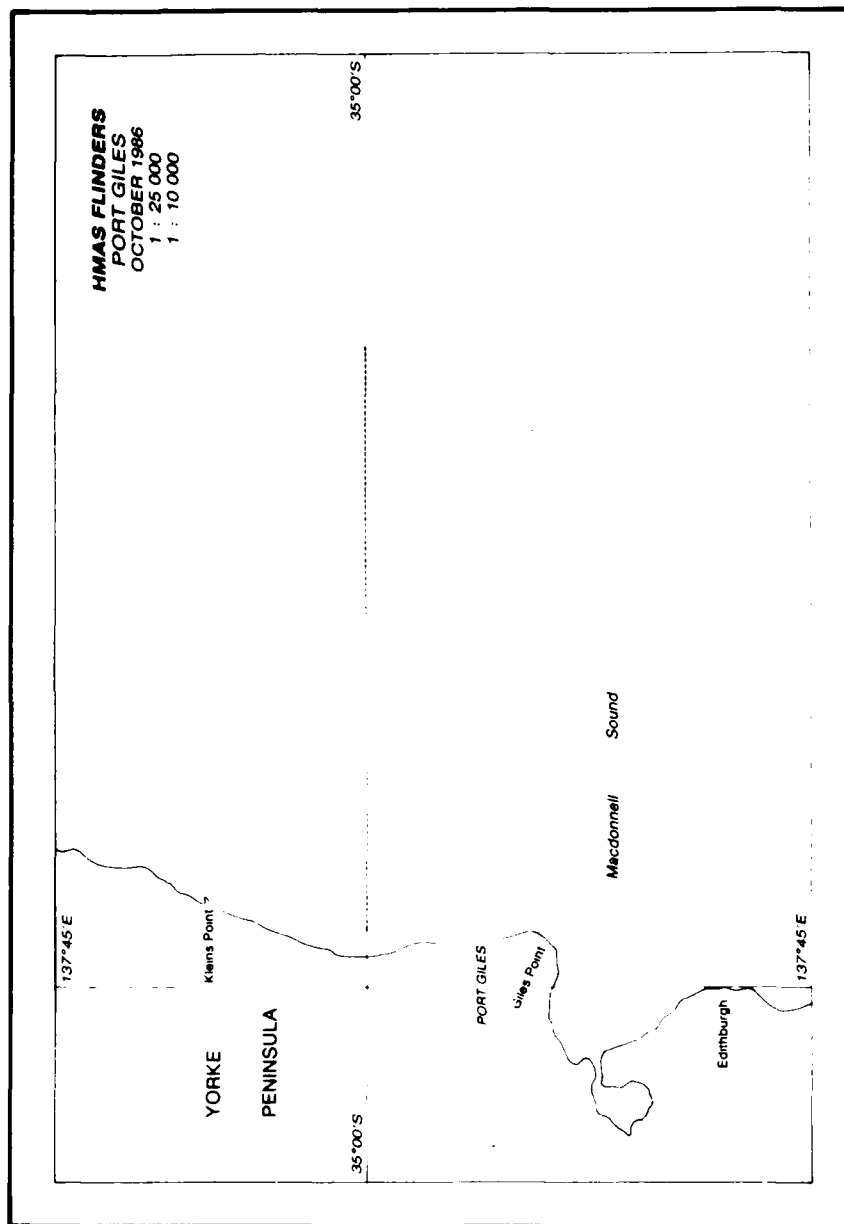


PLATE V

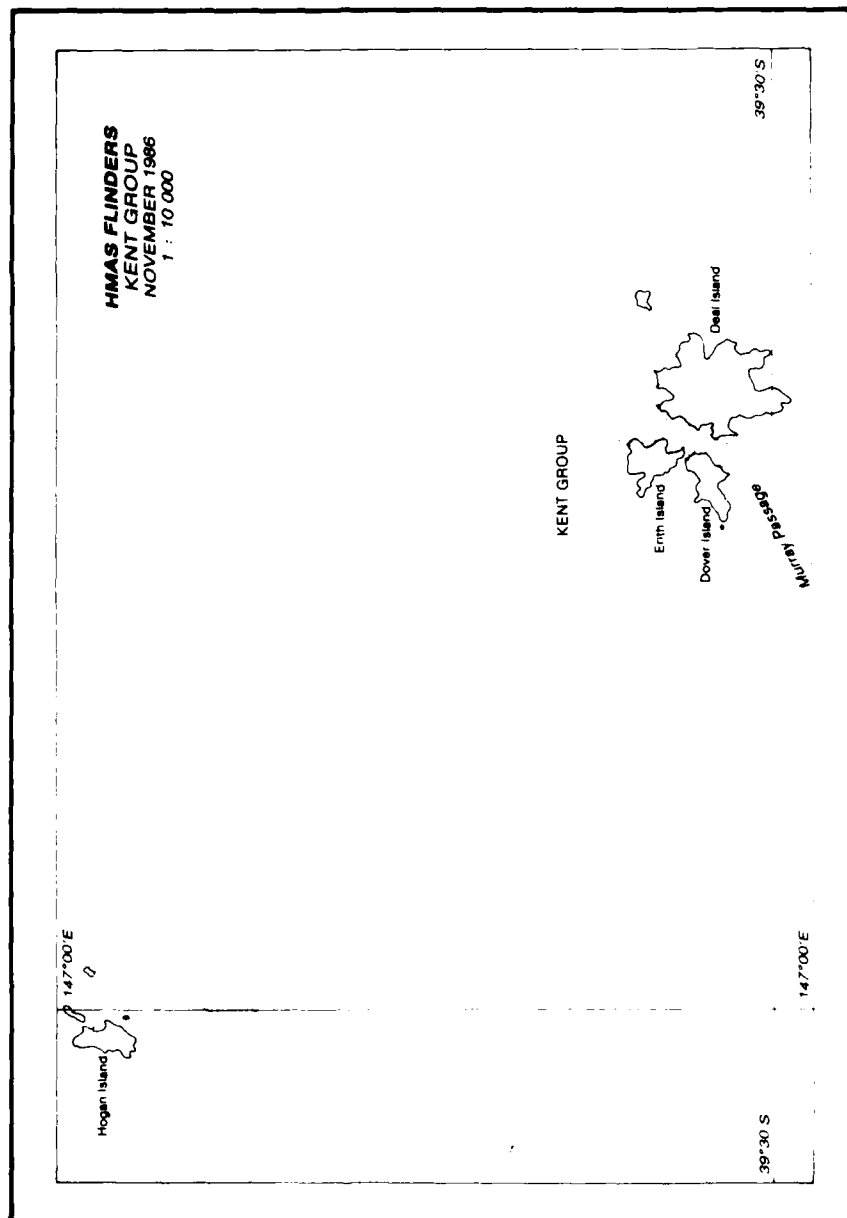


PLATE VI

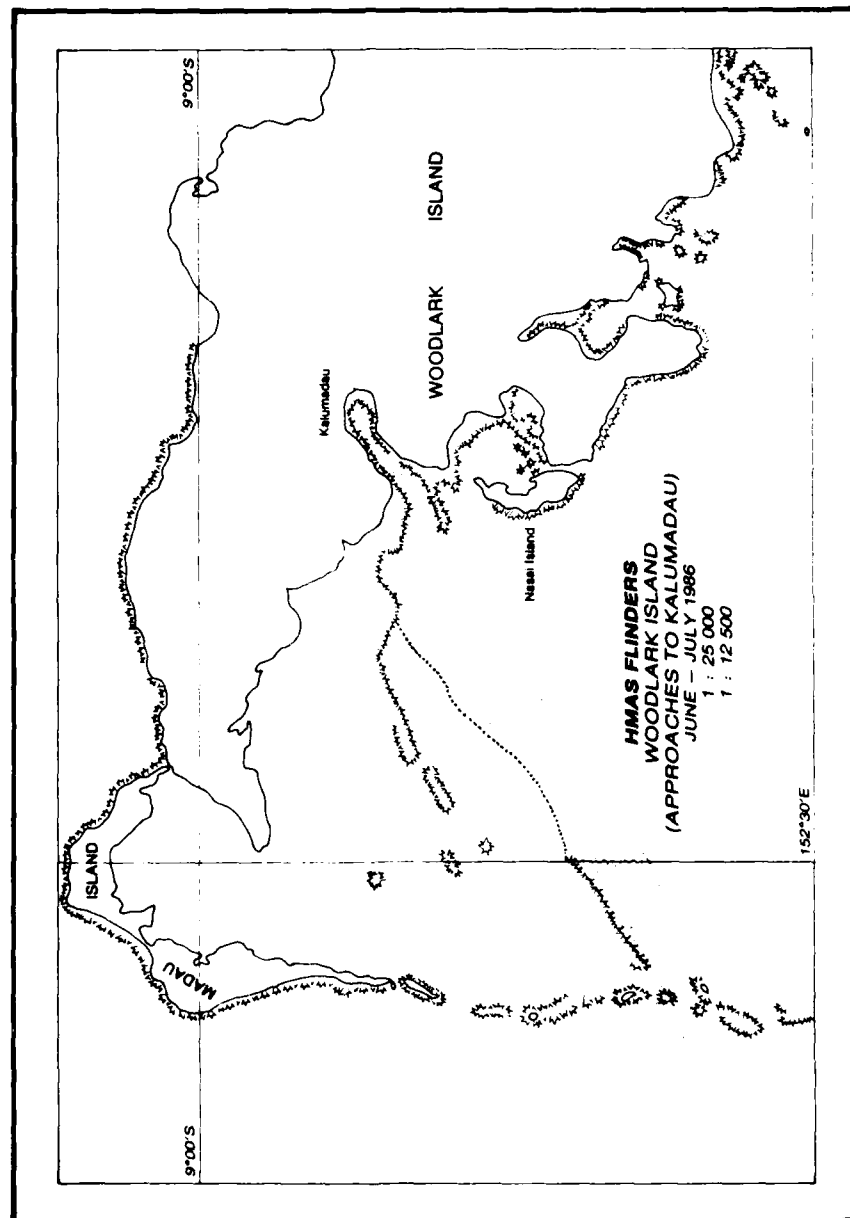


PLATE VII

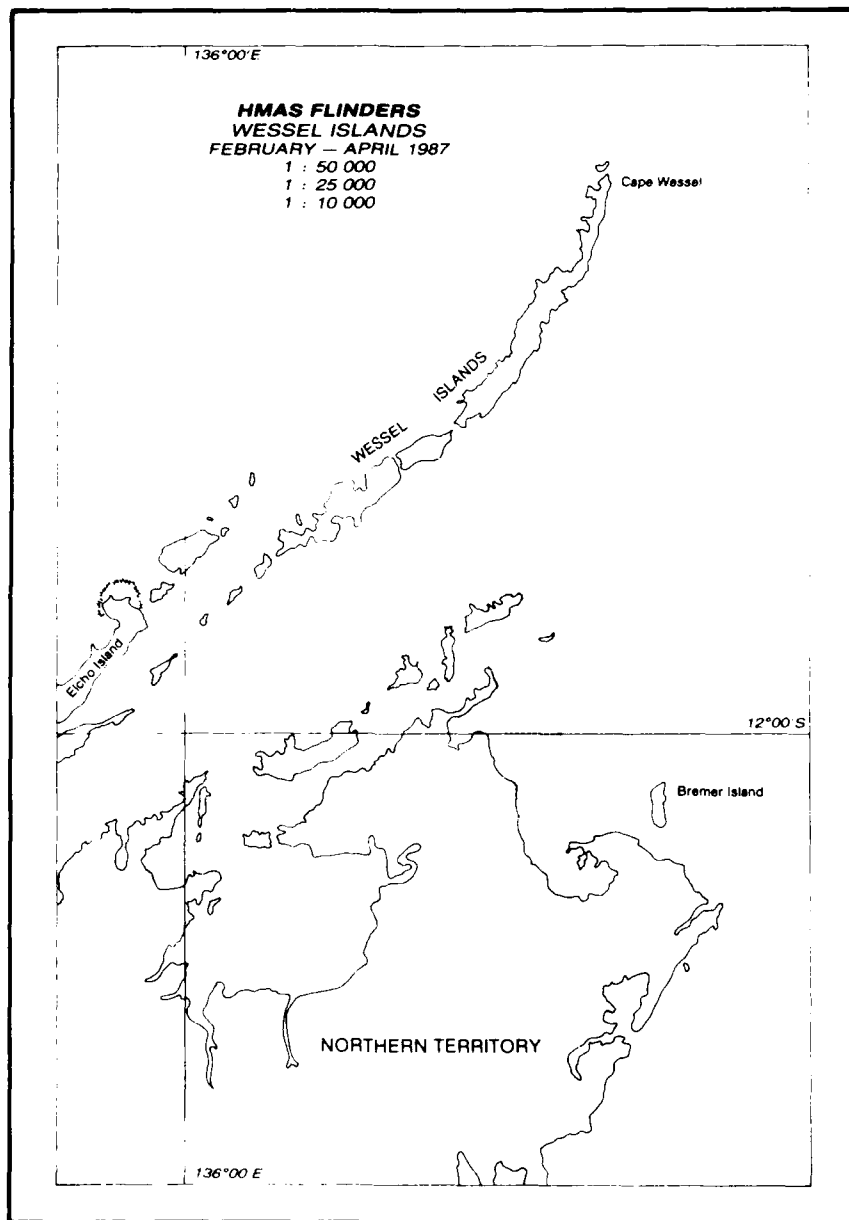


PLATE VIII



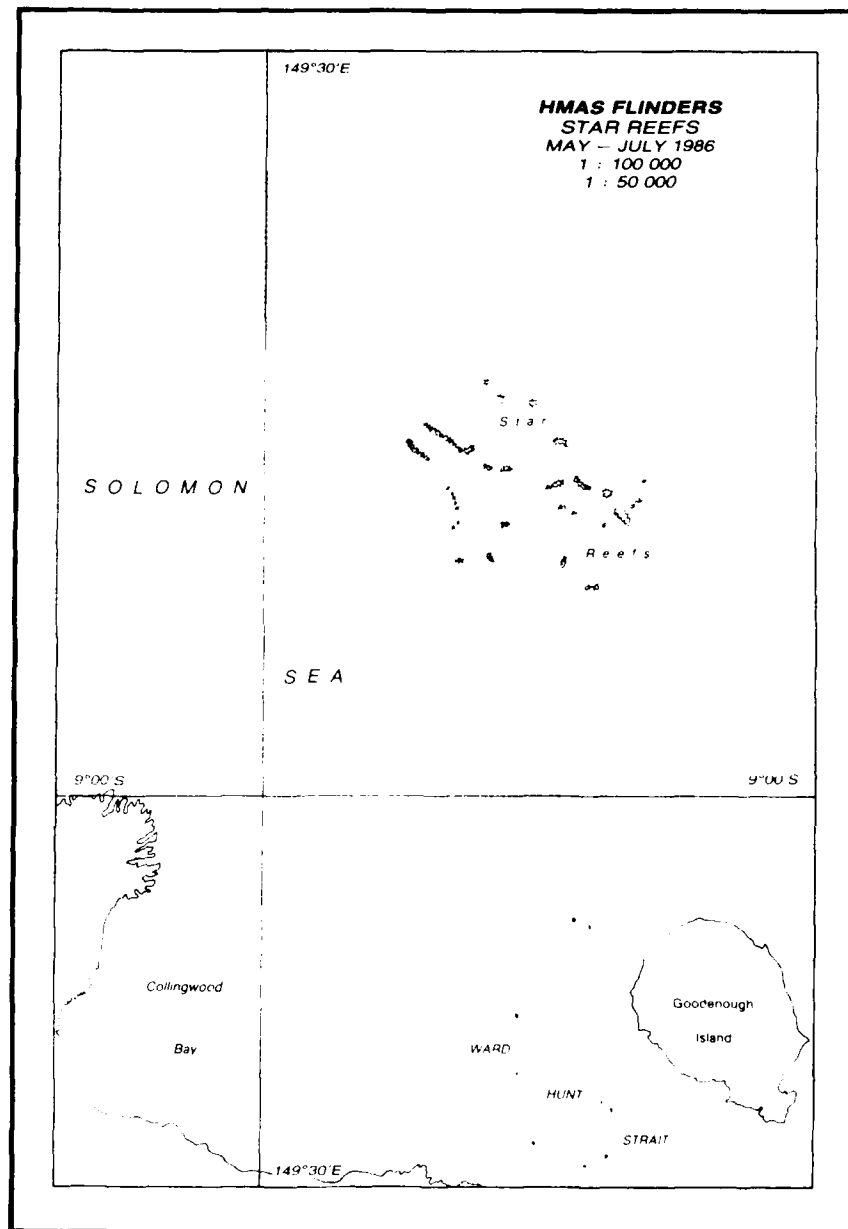


PLATE IX

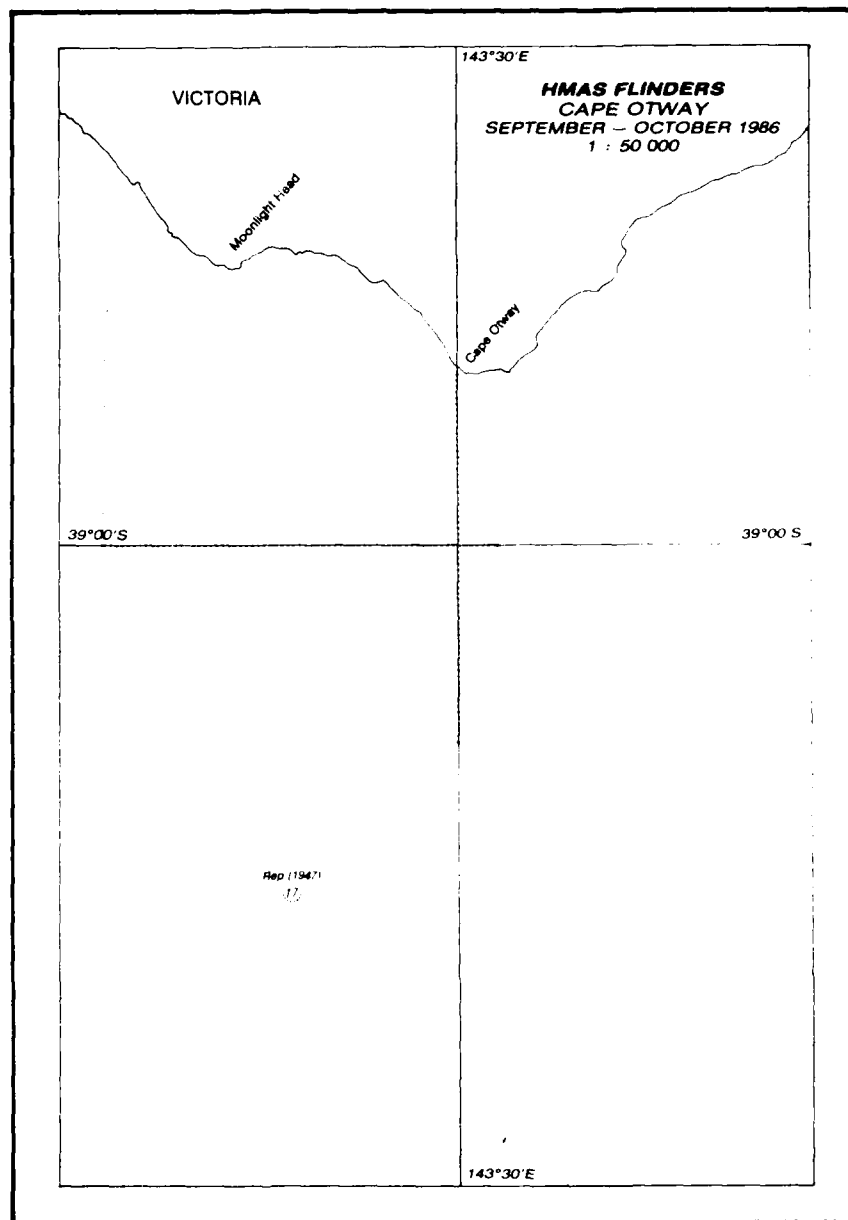


PLATE X

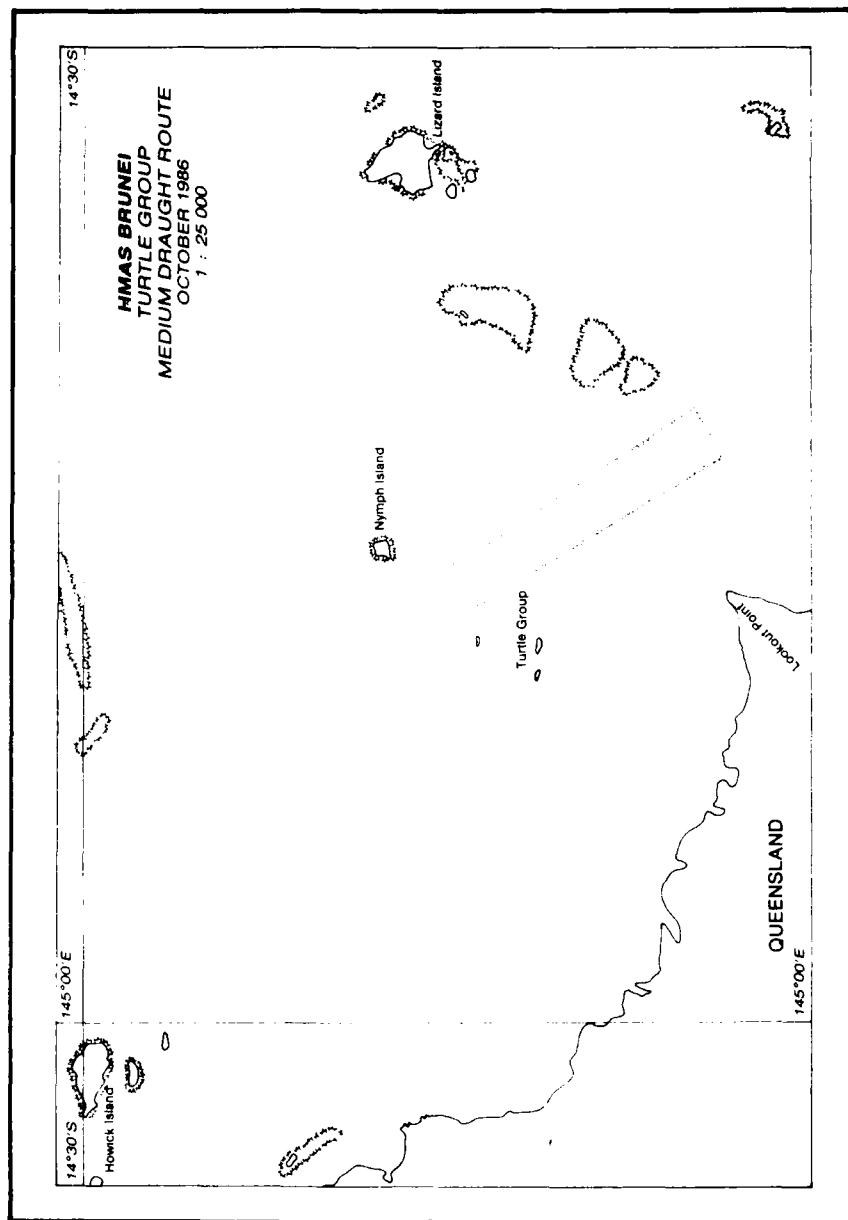


PLATE XI

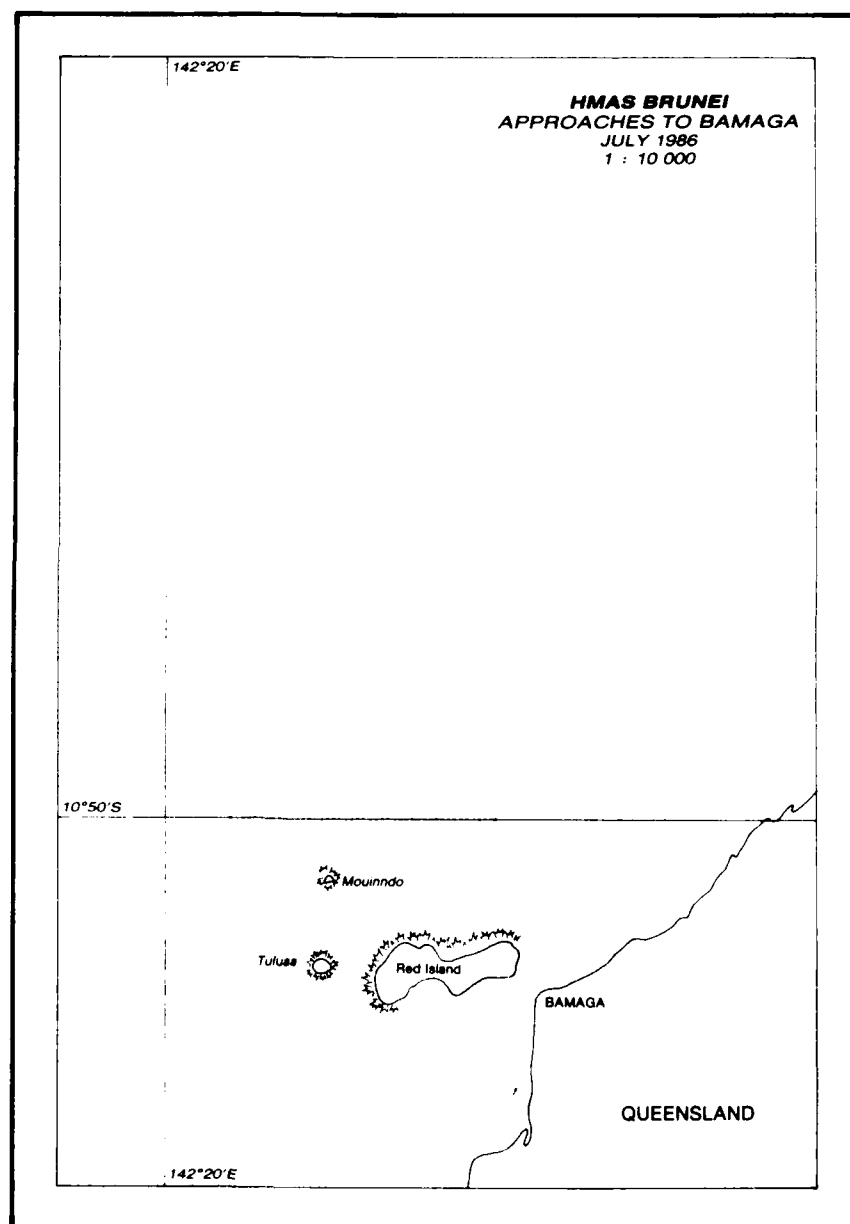


PLATE XII

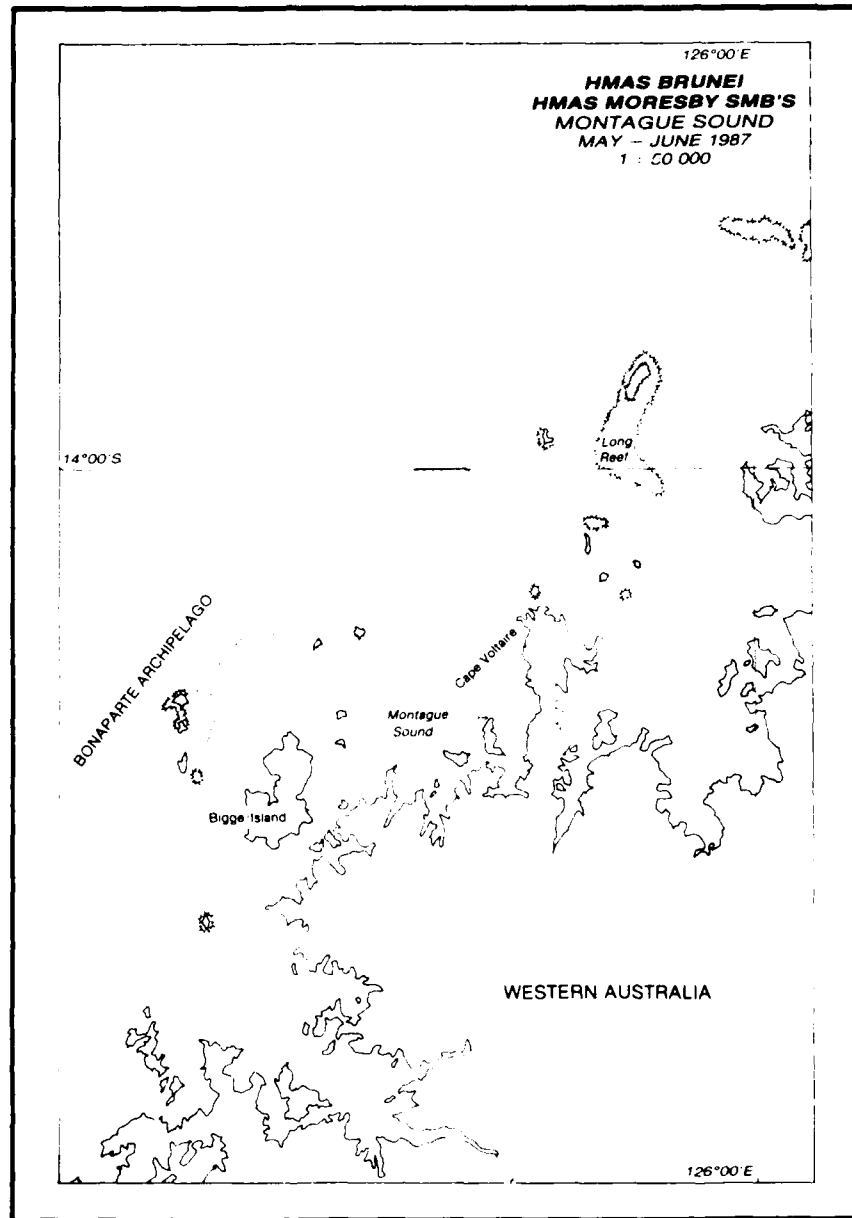


PLATE XIII

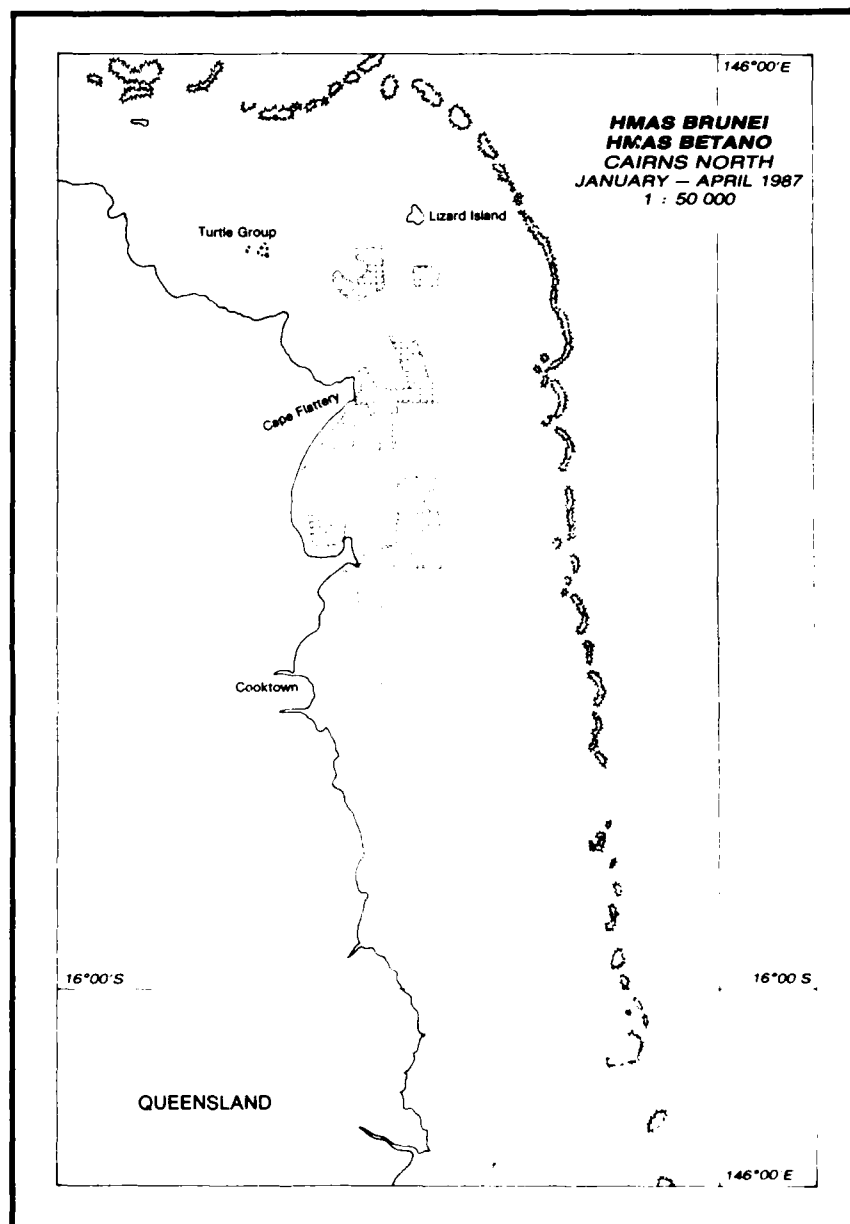


PLATE XIV

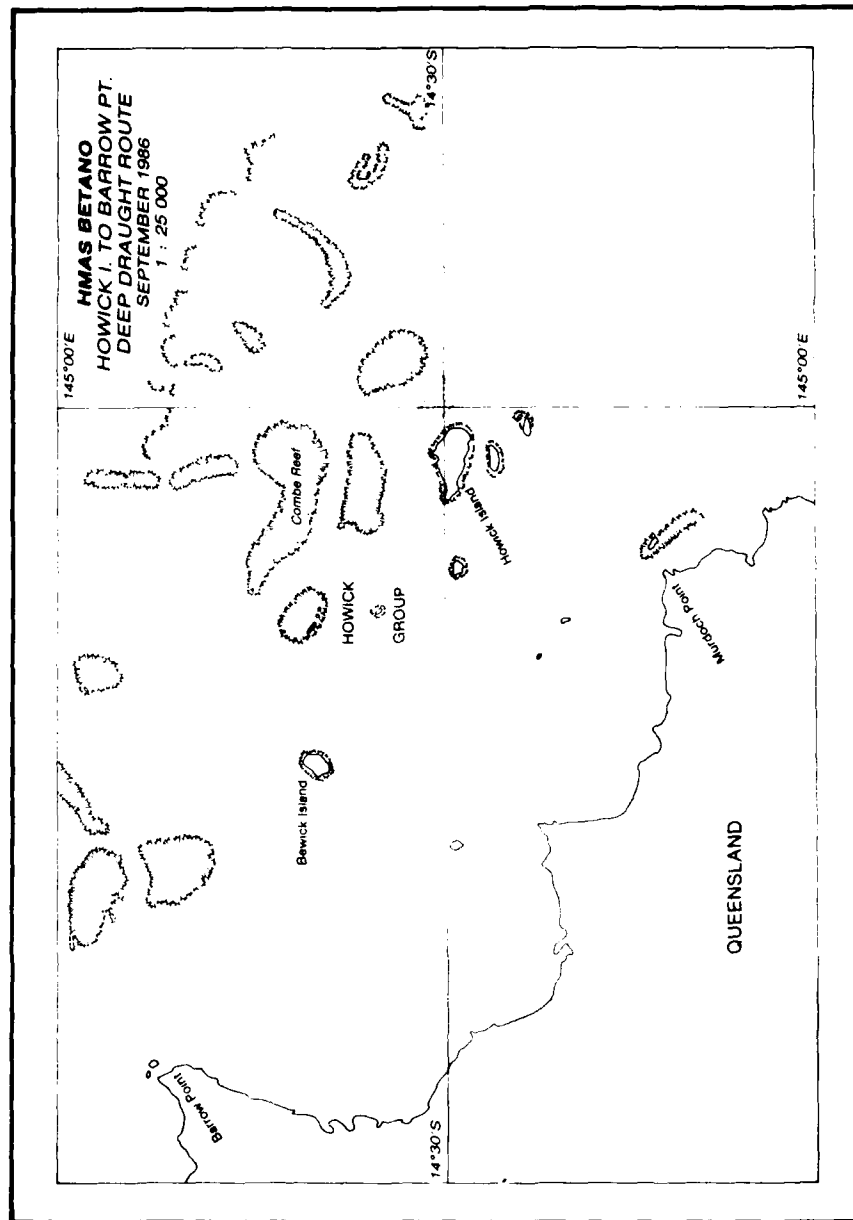


PLATE XV

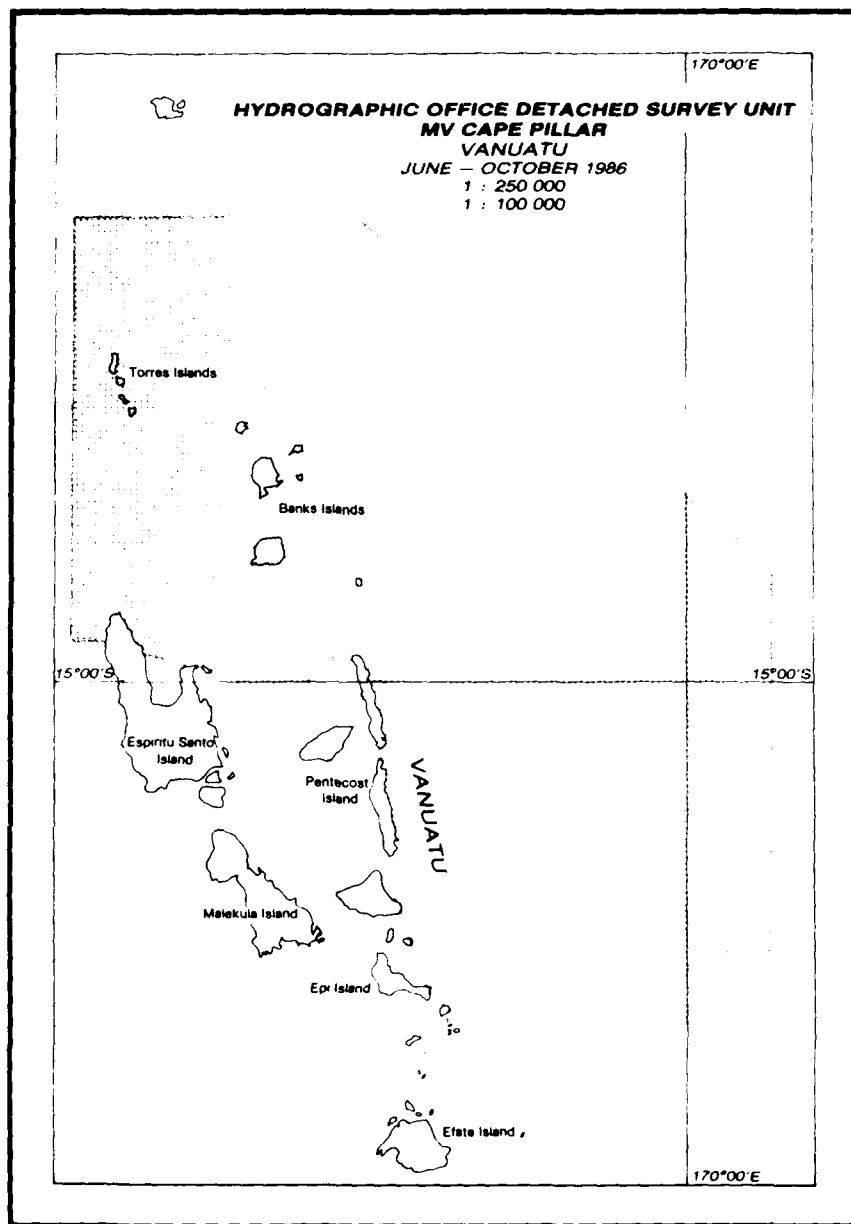


PLATE XVI



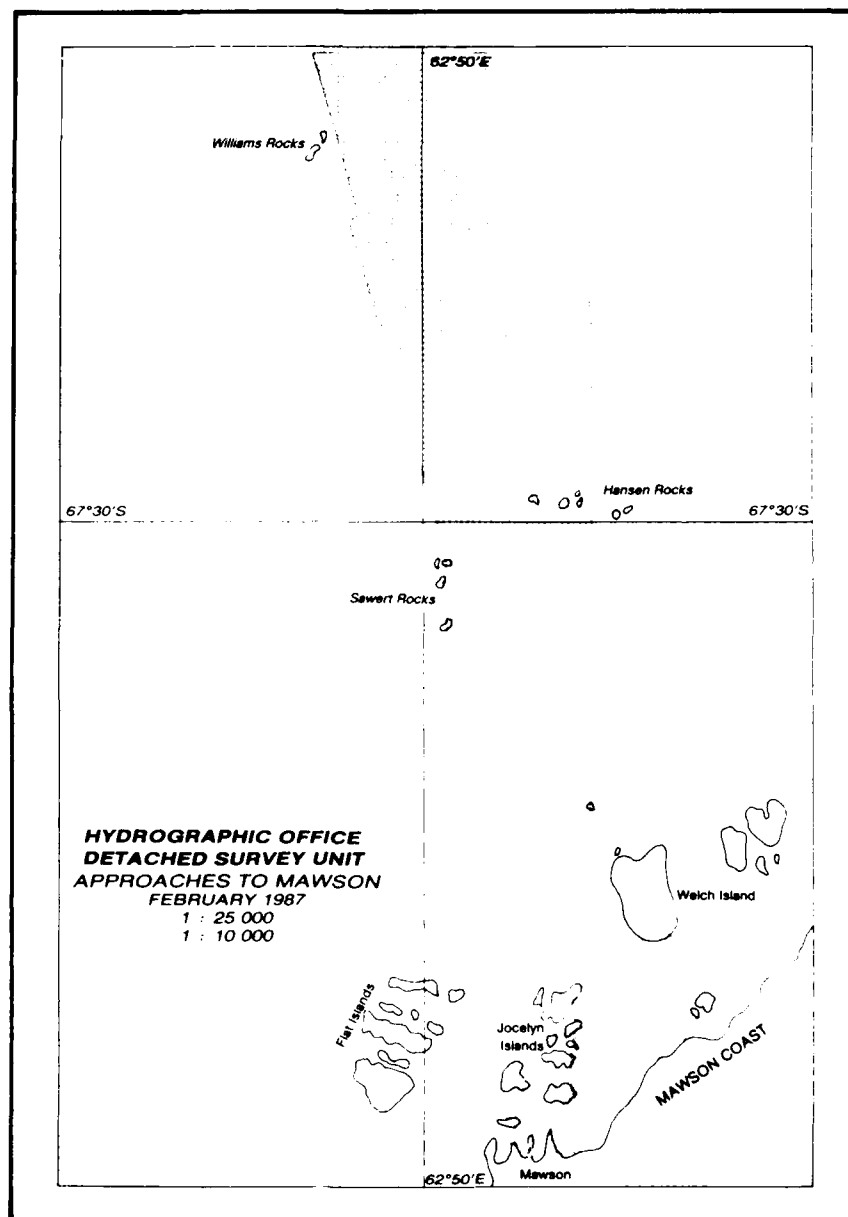


PLATE XVII

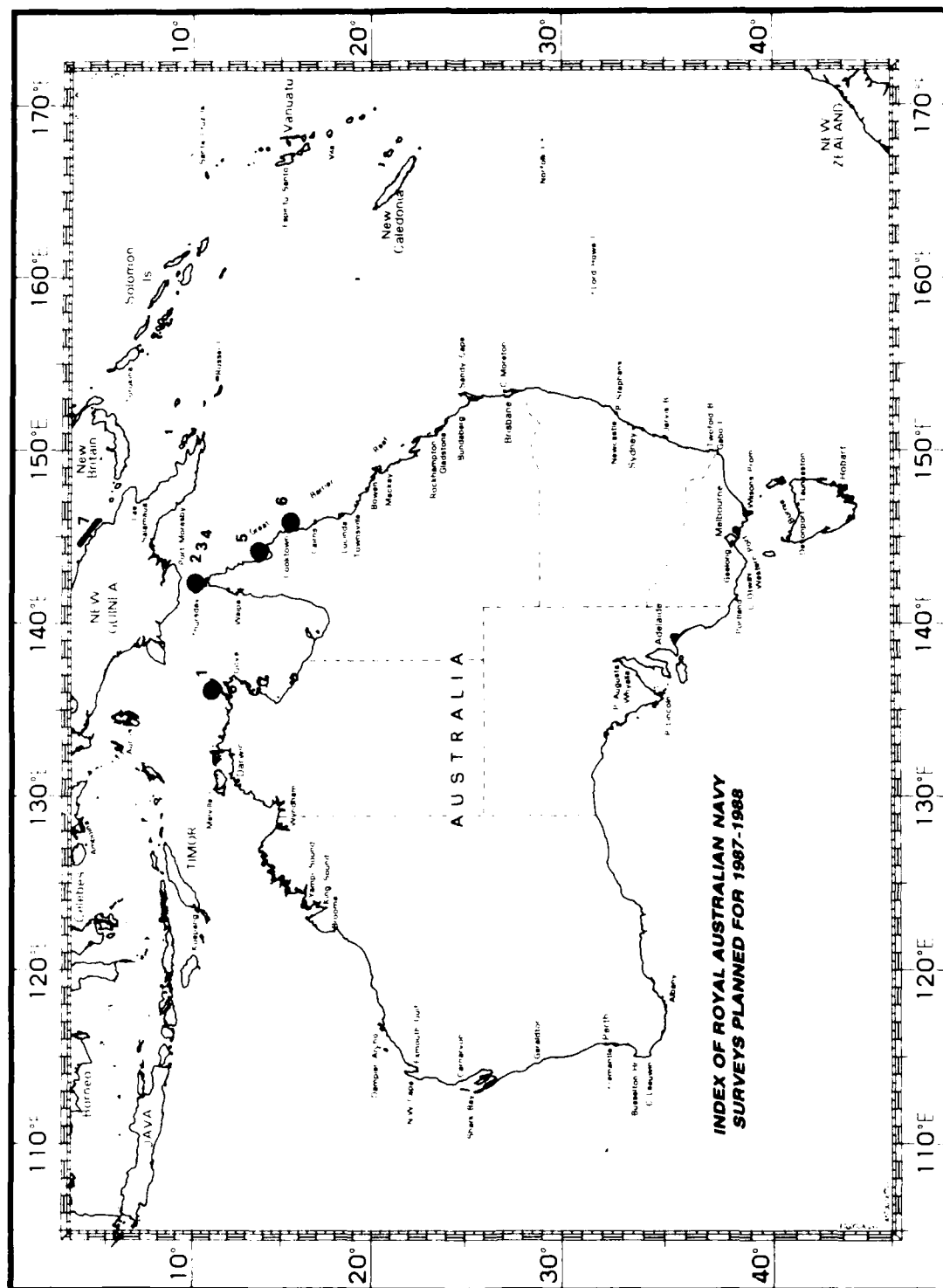


PLATE XVIII

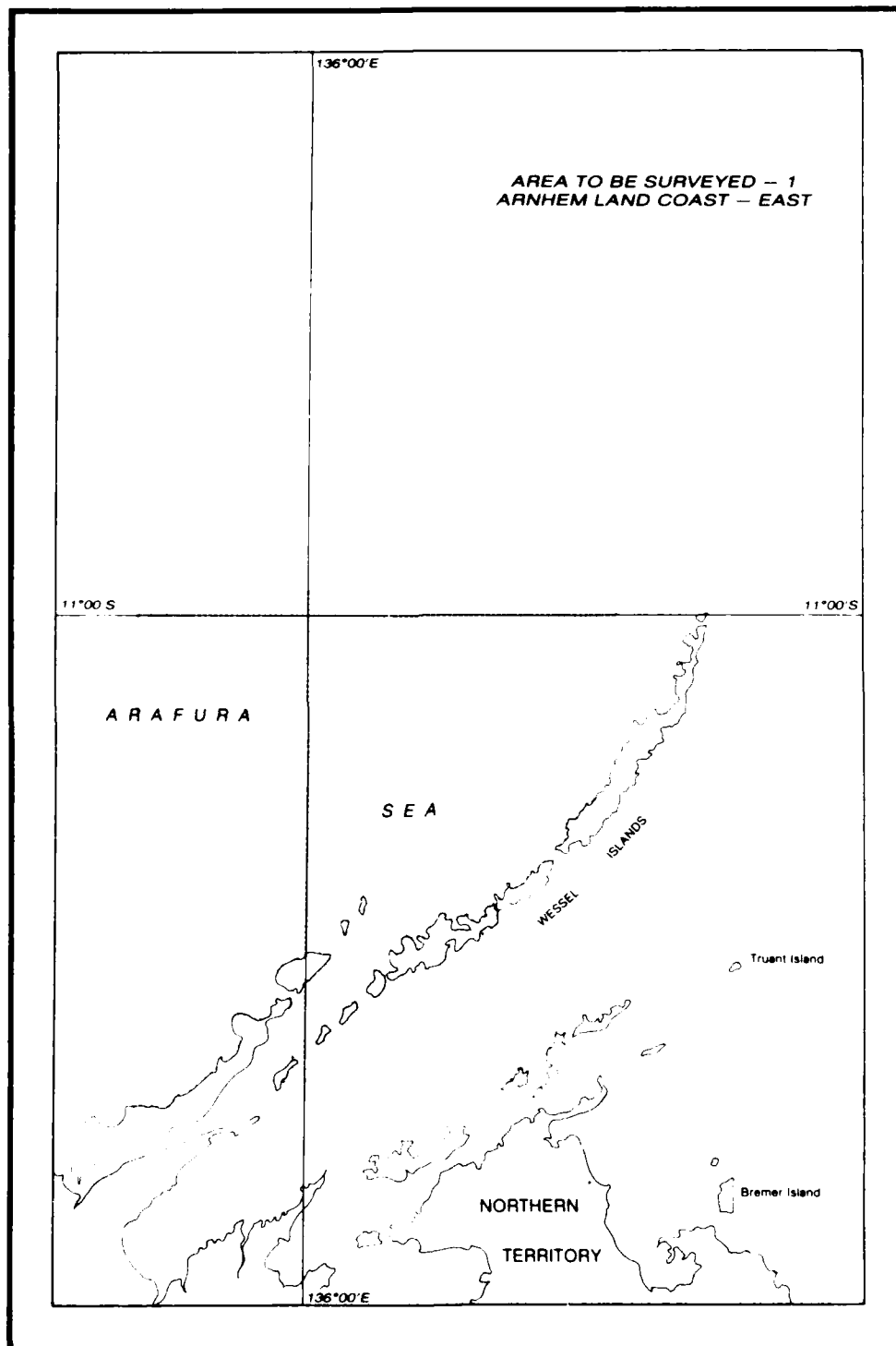


PLATE XIX

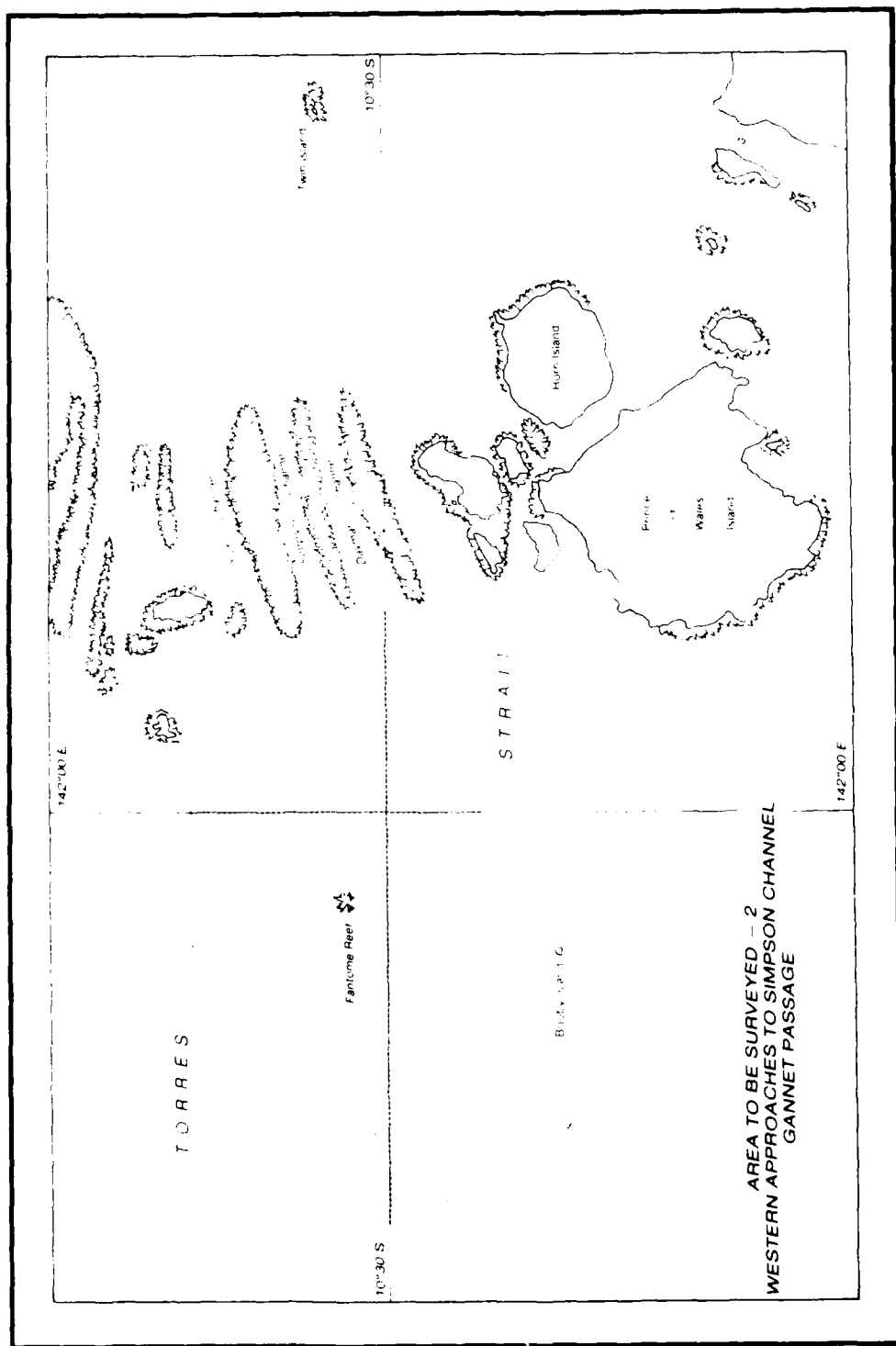


PLATE XX

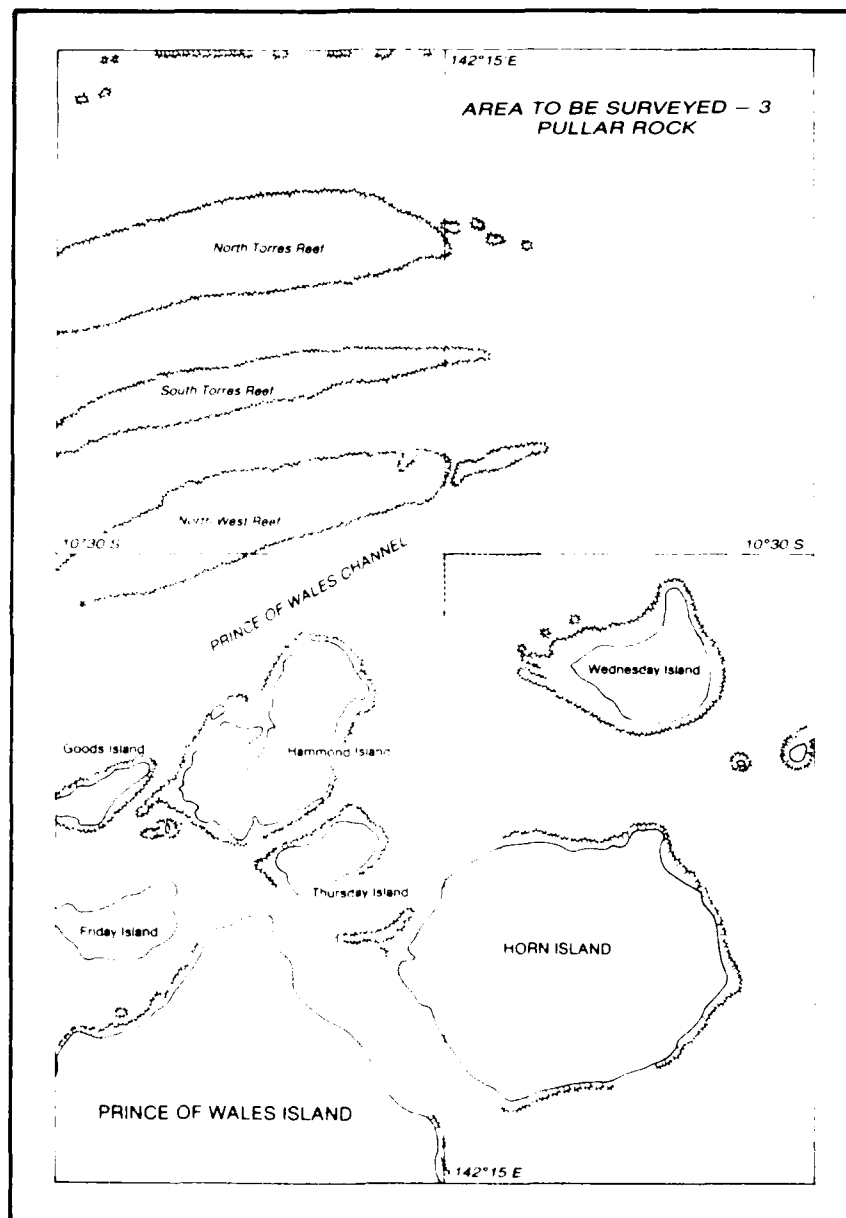


PLATE XXI

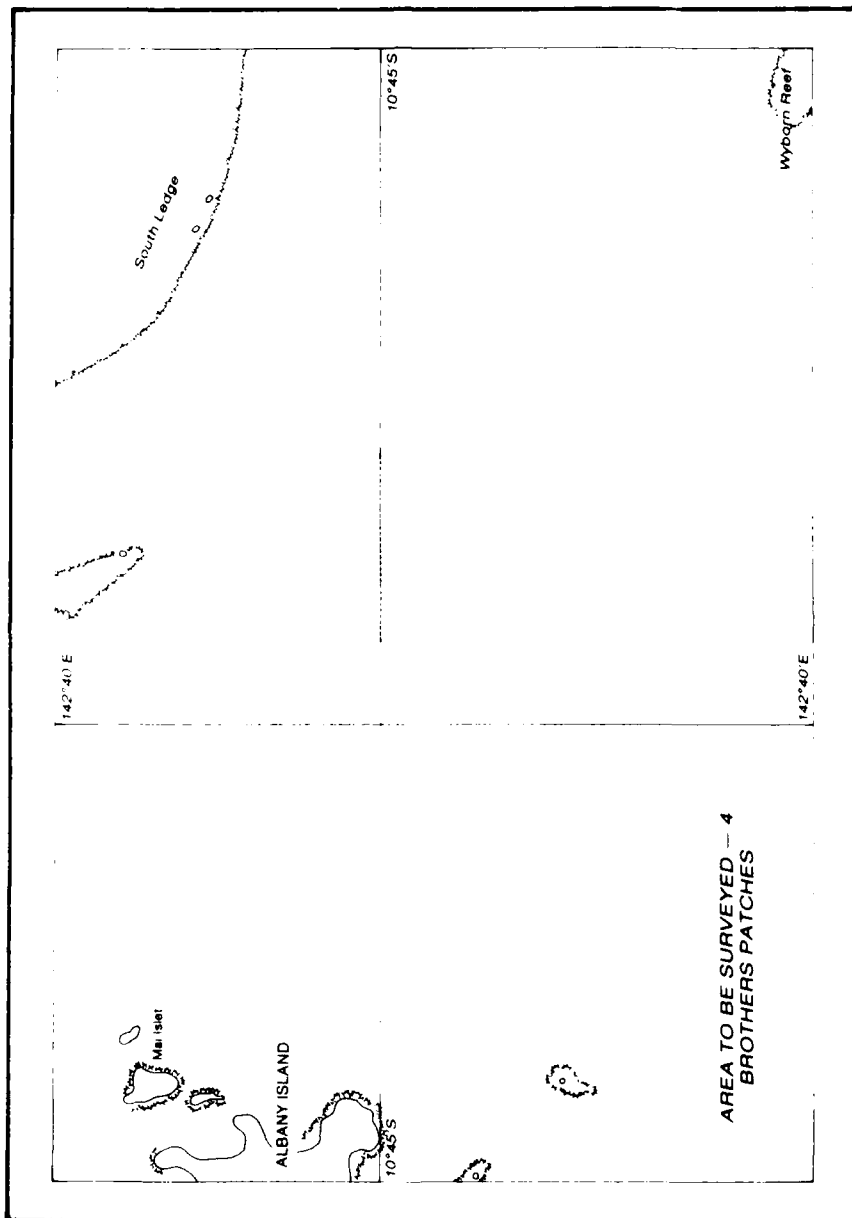


PLATE XXII

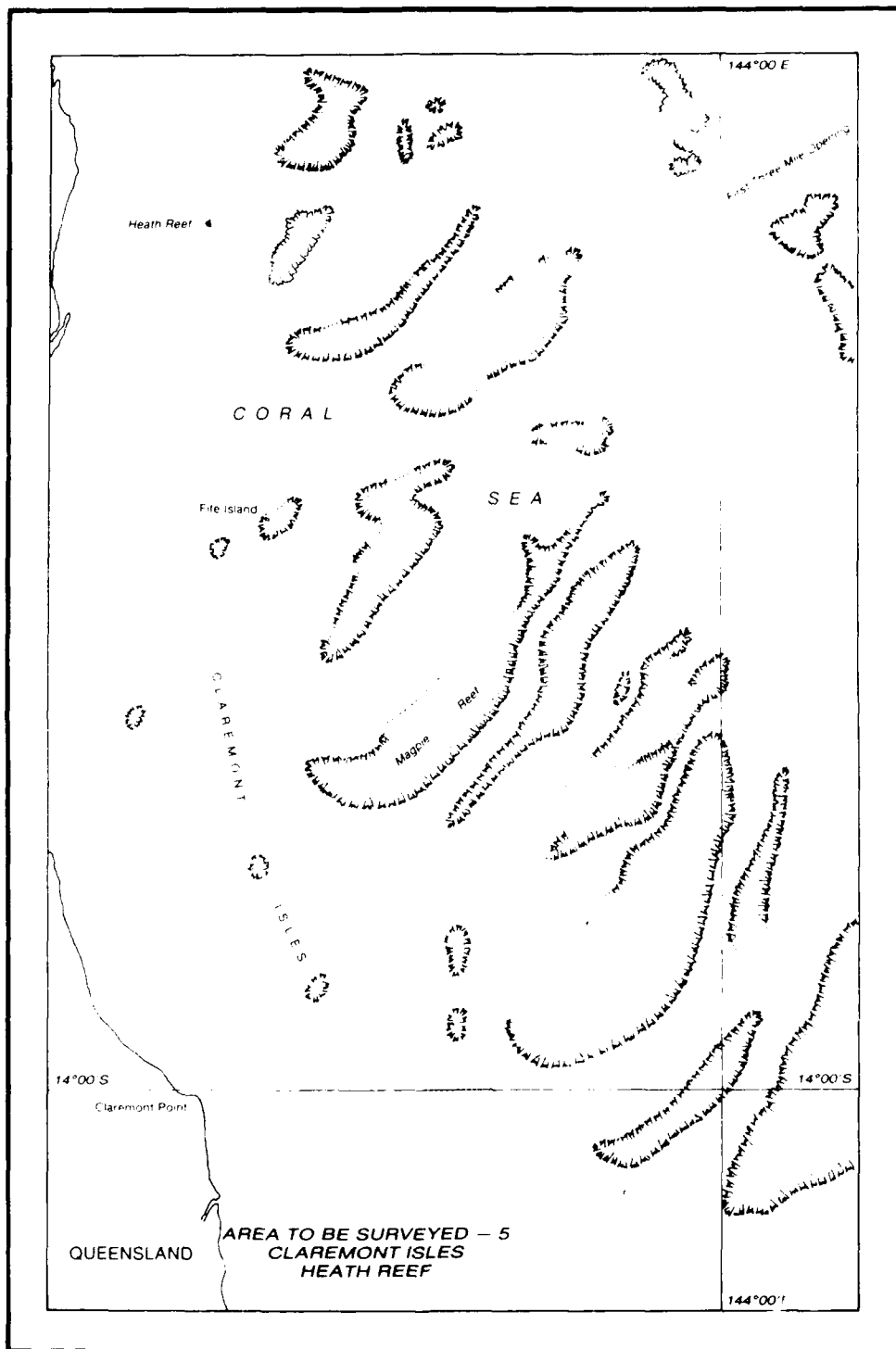


PLATE XXIII

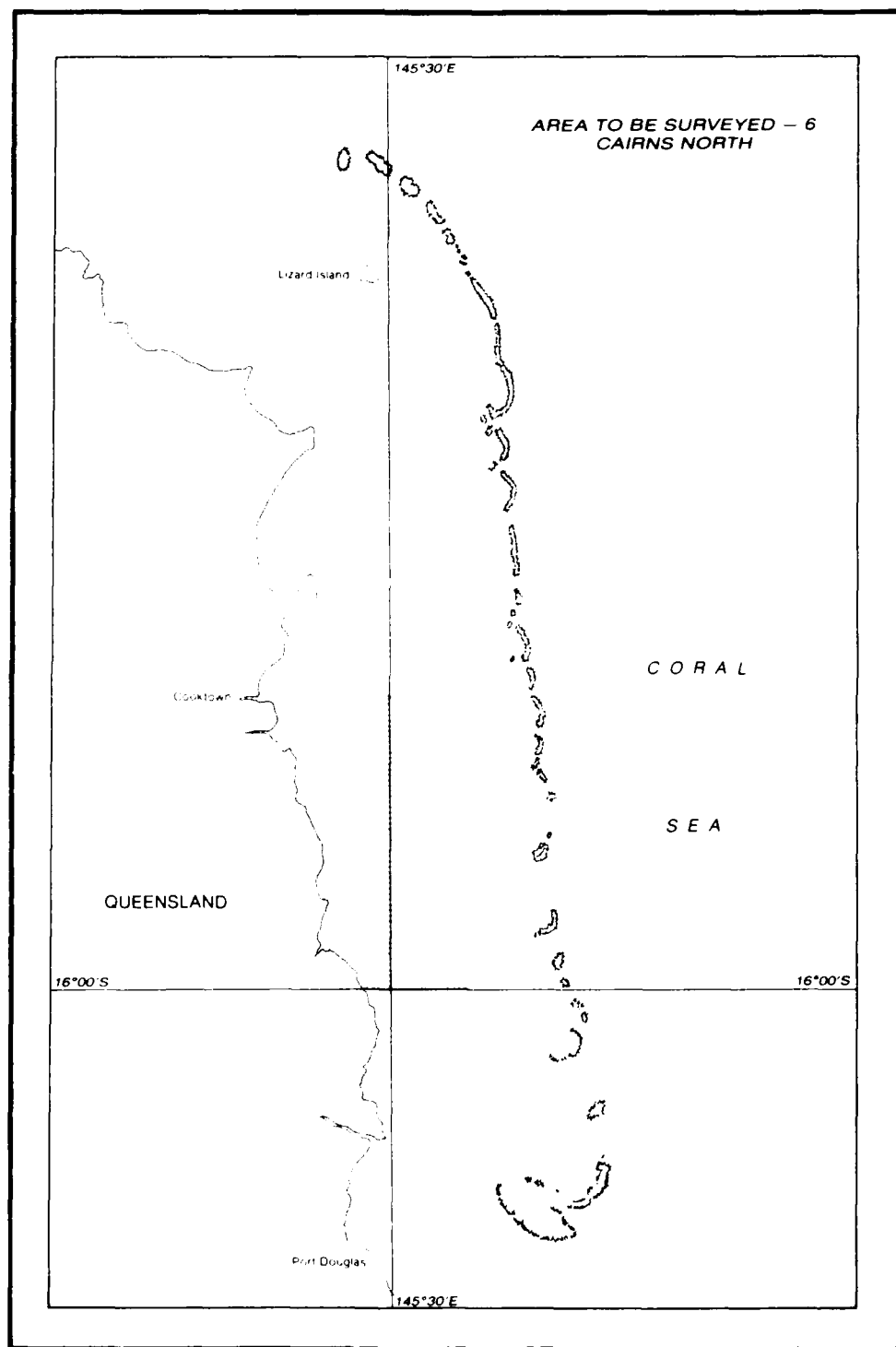


PLATE XXIV



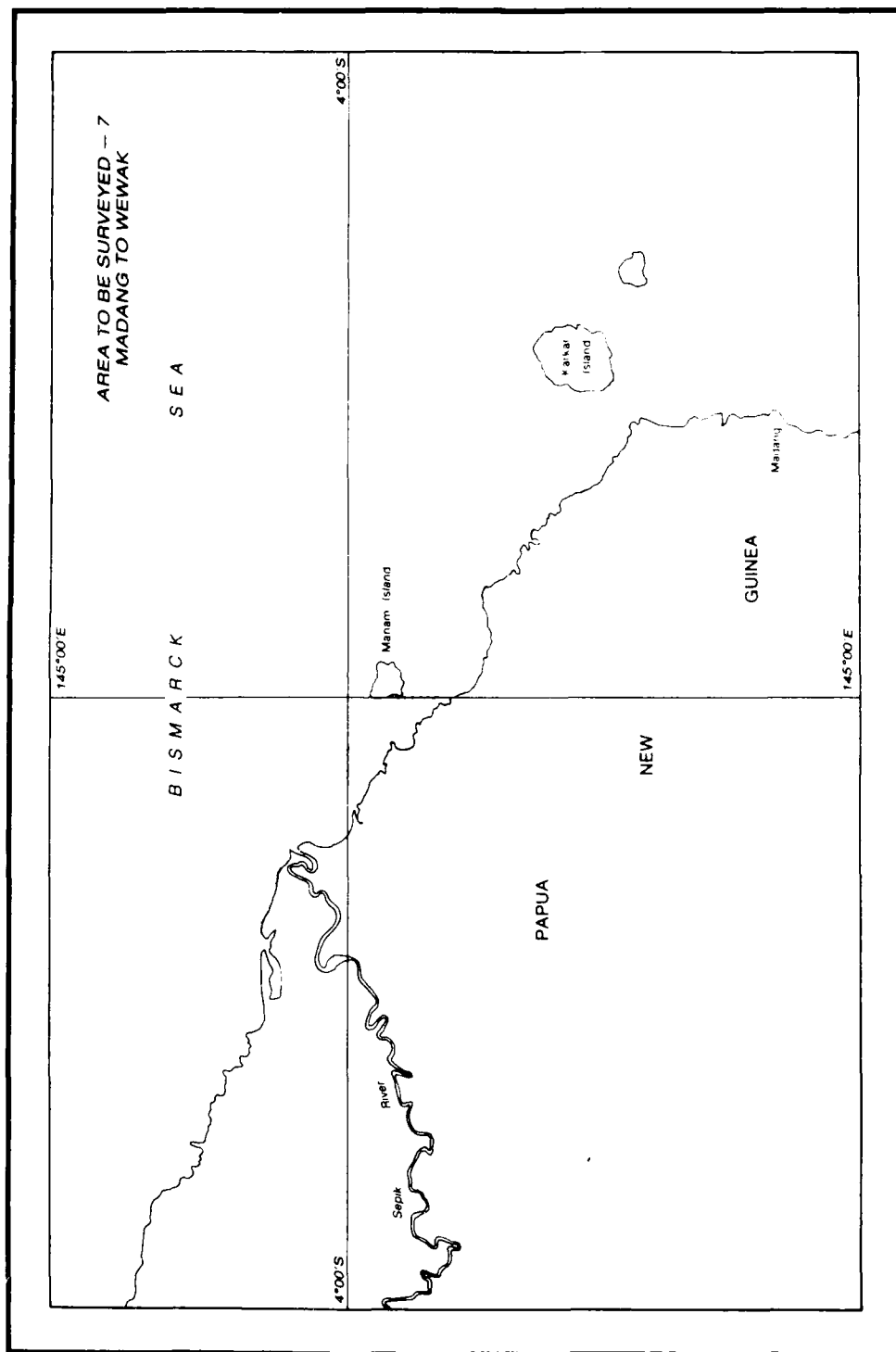


PLATE XXV

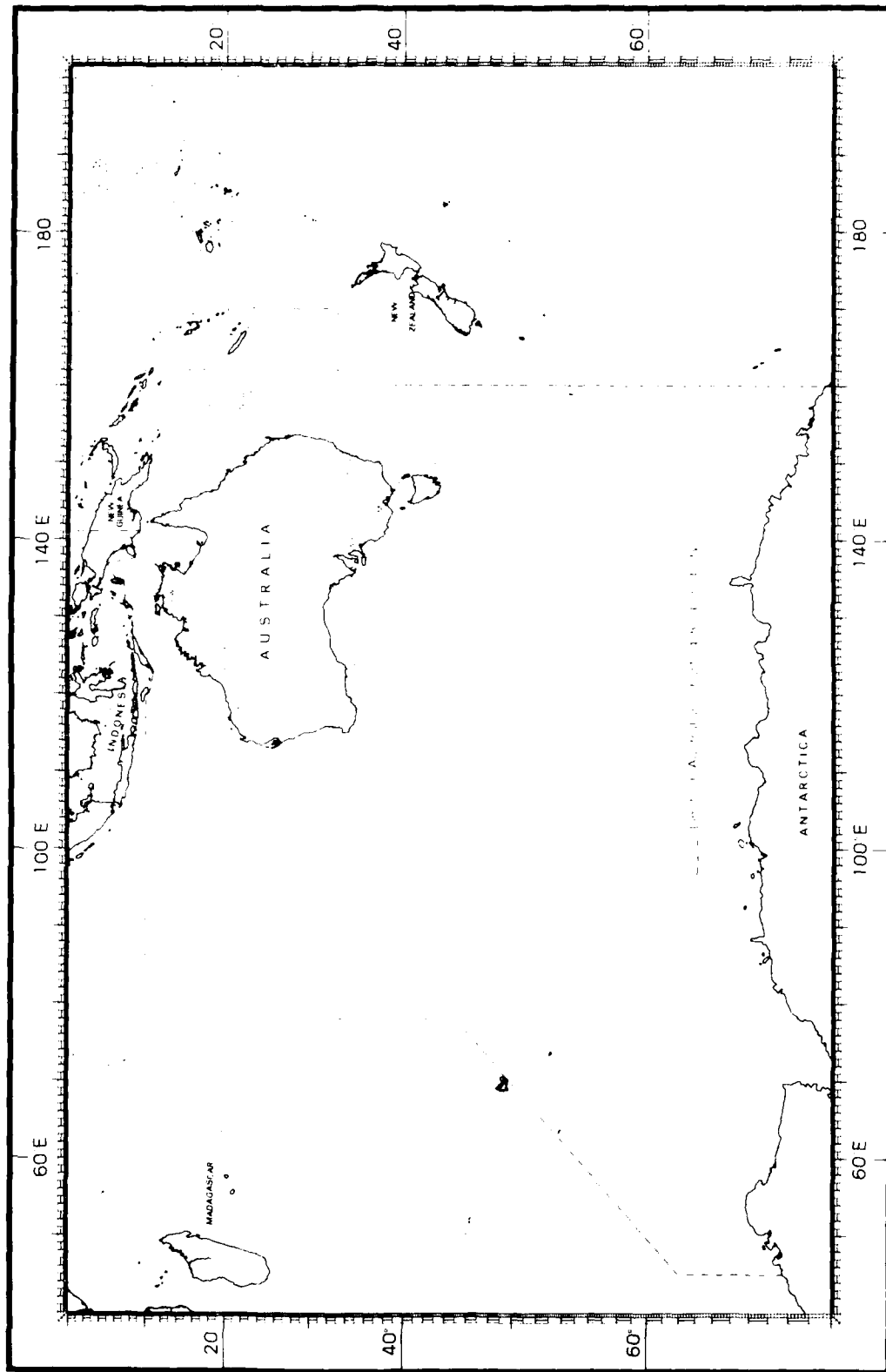


PLATE XXVI





PLATE XXVIII

## DISTRIBUTION LIST

### 1. Departmental and Service Authorities

Department of Defence (28 copies), for attention:  
 The Minister for Defence.  
 Secretary, Department of Defence.  
 Chief of the Defence Force Staff.  
 Chief of Naval Staff.  
 Deputy Chief of Naval Staff.  
 Chief of Naval Development.  
 Chief of Naval Materiel.  
 Chief of Naval Personnel.  
 Chief of Naval Engineering.  
 Director General, Naval Plans and Policy.  
 Director General, Supply - Navy.  
 Director General, Joint Operations and Plans.  
 Director, Joint Intelligence Organisation.  
 Director of Public Information.  
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 Joint Services Staff College, Canberra.  
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 Defence Research Centre, Salisbury.  
 RAN Research Laboratory.

### 2. Commonwealth and State Organisations

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 CSIRO Division of Fisheries and Oceanography.  
 Secretary, Senate Standing Committee for Trade and Commerce.  
 Department of Primary Industry, Fisheries Division.  
 Great Barrier Reef Marine Park Authority, Canberra.  
 Great Barrier Reef Marine Park Authority, Townsville.  
 Department of Foreign Affairs (for ADAB).  
 Australian Parks and Wildlife Service.  
 Department of Transport (Maritime Safety Division) (4 copies).  
 Bureau of Meteorology, Melbourne.  
 Surveyor General, New South Wales.  
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 Central Mapping Authority, New South Wales.  
 Department of Public Works, New South Wales.

### **3. Port and Marine Authorities**

Chief Executive Officer, Association of Australian Port and Marine Authorities

#### **QLD**

Department of Harbours and Marine, Brisbane.  
Port of Brisbane Authority.  
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Cairns Port Authority.  
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Rockhampton Harbour Board.  
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#### **NSW**

Maritime Services Board of New South Wales.

#### **VIC**

Port of Geelong Authority.  
Port of Melbourne Authority.  
Port of Portland Authority.

#### **TAS**

Navigation and Survey Authority of Tasmania.  
Marine Board of Burnie.  
Marine Board of Circular Head.  
Marine Board of Flinders.  
Marine Board of Hobart.  
Marine Board of King I.  
Port of Devonport Authority.  
Port of Launceston Authority.

#### **SA**

Department of Marine and Harbours - Adelaide.

#### **WA**

Department of Marine and Harbours, Western Australia  
Albany Port Authority  
Bunbury Port Authority  
Esperance Port Authority  
Fremantle Port Authority  
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#### **NT**

Department of Ports and Fisheries, Darwin.  
Darwin Port Authority.

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Mission Oceanographique du Pacifique, FME, Noumea, New Caledonia  
Surveyor General, Papua New Guinea  
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OIC Hydrographic Unit, Royal Fiji Military Forces  
Advisor, Hydrographic Unit, Solomon Islands  
Advisor, Hydrographic Unit, Vanuatu  
The Librarian, PNG University of Technology

## **6. Research Organisations and Professional Bodies**

The Victorian Institute of Marine Science  
The Australian Institute of Marine Science, Townsville  
The Flinders Institute of Atmospheric and Marine Science  
The Hydrographic Society, Australasian Branch  
The Australian Institute of Cartographers  
The Institution of Surveyors, Australia

## **7. Tertiary Educational Institutions**

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South Australia	Adelaide University Flinders University South Australian Institute of Technology
Western Australia	Western Australia University Murdoch University The Curtin University of Technology
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